The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

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Contents

NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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Colonial Trade

THE fact that the present issue of THE CHEMICAL AGE —the annual Colonial Number—is the largest yet issued, alike in editorial and advertising matter, reflects to some extent the interest displayed by United Kingdom chemical manufacturers and merchants in trade with the Colonies. While no one will deny the potentialities of the Central European markets, we have abundant opportunities within our own Empire. It is therefore gratifying to note the formation, under the presidency of Lord Long, of an Empire Development Union, which has for its objects the promotion of trade within the Empire on the lines of the resolutions unanimously adopted at successive Imperial Conferences at which all the Governments of the Empire were represented. The decisions of these Conferences embrace legislative and administrative measures dealing with the development of Empire resources by joint action, the organisation of supplies of raw materials, the safeguarding of essential industries, protection against dumping, the development of Customs and administrative preference within the Empire, and special subjects for co-operation, such as dyes, non-ferrous metals, etc. The organisers of the Union, in illustration of the bearing of their policy upon our present economic difficulties, point out that before the war our exports to the self-governing Dominions were more than double our exports to the markets of Central Europe, and that our export trade to Russia, Germany and the United States, with a total population of nearly 350 millions, was £88,000,000 in 1913, while that to Australia, New Zealand, South Africa and Canada, with their population of less than twenty millions, reached £91,000,000. Taking the last pre-war year as a basis of comparison it is shown that every Briton in these four Dominions overseas spent on an average eight times as much as every German on British goods, fifteen times as much as every American, and forty-six times as much as every Russian.

Waking Up!

To the suggestions we made a fortnight ago for the formulation of a more definite policy for the Society of Chemical Industry—suggestions which, it is clear, from the opinions expressed on the subject, are generally approved—Dr. Ruttan adds another which is worth consideration. In the course of some impressions and opinions published in this issue, he suggests that the subject of the presidential address, if suitable, should be thrown open for discussion on the morning of the second day, or, alternatively, that some matter of general interest should be introduced by one or two members and followed by an open debate. It is pretty safe to predict that such an experiment would provide an attractive morning session, and would serve a useful purpose in opening out opinion within the Society and bringing it to bear, with a stimulating effect, on the Society's work. Judging by the attention which is being directed to the need of greater publicity, a frank debate on the Society's present policy of restricting information about its own proceedings should produce a certain air of liveliness. There would be no great harm in that; on the contrary, there is a growing body of opinion among the younger minds in favour of putting a little more life into the business and keeping pace with current public opinion.

Of course, those dear old creatures "Dilly" and "Dally," two of our friend Poy's most entertaining creations, would shake their heads and speak dismal words into their beards. But they have had a good long innings, and a little brighter cricket would do the Society good. Dr. Ruttan's proposal is certainly worth a trial. If a few influential members would only be tempted for once into a thoroughly indiscreet public frankness, there might be an interesting half-column in every daily the next morning, and the public would discover that there is a really great Society of Chemical Industry in their midst of which they had previously never heard. "Dilly" and

"Dally" would be so shocked at seeing the Society reported in the daily Press that they would probably retire from the committees they prevent from ever doing anything, and seek appropriate repose among the bishops at the Athenæum.

The Sulphur Cycle in Nature

THOSE who study nature by the methods of science can fully appreciate the significance of the old adage: "It is the little things that count." Vast changes, continually going on in the realm of nature, are wrought by the slow action of myriads of minute living organisms, their decomposition of complex nitrogenous compounds being well known. It is not so generally realised that sulphur is a constant and, therefore, probably a necessary, constituent element of living material, and that these micro-organisms effect important changes in sulphur-containing substances. There appear to be two opposing forces in nature in the transformation of sulphur compounds. One of these results in the production of hydrogen sulphide from protein decomposition and the reduction of sulphates; the other is concerned in the oxidation of hydrogen sulphide, with the re-formation of sulphates. Thus we have:—

(1) *Hydrogen Sulphide Formation*:
- (*a*) Putrefactive decomposition of proteins by bacteria.
- (*b*) Reduction of sulphates by anærobic organisms.
- (*c*) Decomposition of sulphides, by carbonic and fatty acids produced by bacterial action.

(2) *Oxidation of Hydrogen Sulphide*:
- (*a*) By bacterial action with production of sulphates.
- (*b*) By the higher bacteria, separating sulphur, which is oxidised to sulphuric acid.
- (*c*) By chemical action, oxides interacting with sulphur, the resulting sulphides being oxidised in air to sulphates.

It should not be overlooked, however, that the evil odour accompanying the putrefaction of protein substances is not always due to sulphuretted hydrogen alone; bodies, for example, such as mercaptan, C_2H_5SH, have been identified in the products of such decompositions. There is a remarkable analogy between the transformations undergone by sulphur compounds and those of nitrogen in the organic world. The plant takes up these elements in the forms of sulphates and nitrates, producing vegetable albumins. From the sulphur compounds, bacteria, or the animal, produce hydrogen sulphide and other substances; from nitrogenous compounds, the same agencies form urea and ammonia. By the action of micro-organisms oxidation in each case takes place with re-formation of sulphates and nitrates. Similar agencies produce reductions, nitrates being changed to nitrites and ammonia, while the sulphates yield sulphides. In the case of sulphur, the reduction is carried on or facilitated in many instances by anærobic bacterial action in the presence of organic matter. Such action is exemplified in the canals of Holland and in the Manchester Ship Canal, where, in the absence of air and acids, and at a temperature of about 25° C., in presence of phosphates and other suitable pabulum, spirilla-forms of bacteria carry out this reduction process after other micro-organisms have decomposed the greater part of the organic nitrogenous matter. One such organism (*Sp. desulphuricans*) is found in sewage, and in sending sewage out into the sea it is necessary that immediate large dilution shall take place or a similar reducing action with production of hydrogen sulphide is brought about and a nuisance rapidly caused. Such a nuisance, largely due to hydrogen sulphide, is prevalent on the shores of Belfast Lough, where the decomposition of sulphides is brought about by the action of fatty acids. In this locality the drying seaweed undergoes fermentation with the production of propionic and other acids, and these acids set free hydrogen sulphide from the sulphides present in the sea-water and produced by the bacterial reduction of sulphates.

Side by side with these reducing actions in nature occurs the oxidation of hydrogen sulphide. Oxides are converted into sulphides when brought into contact with hydrogen sulphide or free sulphur, and are then oxidised to sulphates in the presence of air. The iron pyrites found in coal is believed to have its origin in the interaction of oxide of iron and sulphides from decaying organic matter. Certain bacteria oxidise hydrogen sulphide directly to sulphate; some organisms do this only if nitrates are simultaneously present. The most frequently occurring oxidation of hydrogen sulphide by such agency is that brought about by the higher bacteria, e.g., *beggiotoa*. This organism is often found in sulphur springs and in sewage; it decomposes hydrogen sulphide with formation of free amorphous sulphur, which it takes up into its cell-substance and uses as a source of energy, producing sulphates. *Beggiotoa* can thus oxidise large quantities of sulphur to sulphate in presence of water and carbonates. Other sulphur-loving organisms oxidise many forms of sulphur compounds to sulphuric acid, and some of these can live in a distinctly acid medium. Although sulphur is present in smaller amount than nitrogen in organic compounds containing both these elements we may see from the above considerations that it plays an essential part in the complex series of transformations which, largely unnoticed, are continually going on around us. Recent discoveries have, indeed, shown us that sulphur compounds are of vital importance to some of the most fundamental actions taking place in the living body.

The Chemical Exhibition at Hamburg

A REPRESENTATIVE of THE CHEMICAL AGE who visited the "Achema" (Austellung für Chemisches Apparatewesen) exhibition of apparatus for chemical industry, which was recently held in Hamburg, returned with his opinion strengthened that in Germany they are past-masters in the art of showing their goods to the best advantage, and that to this end neither money nor trouble are spared. Huge locomotives suitable for chemical works and other full size plant were freely displayed, while the propaganda part was supported by continuous cinematograph performances showing the best examples of important German technical processes. Considering calmly what he saw, our representative states that he was impressed more by all-round progress and increased application of science to plant and machinery than by any striking inventions. Of the latter, with the exception of Plauson's

Colloids, nothing really novel was to be seen. However, this deficiency was balanced by the enterprise shown in the introduction of innumerable improvements in every section, and by the number of appliances which eliminate waste, increase efficiency, and reduce labour. It was impossible but to be forced to the conclusion that this is one of the main reasons for the success of the German chemical industry. If its claims can be substantiated, the first place amongst exhibits of particular interest to British chemists must be taken by Krupp's "V2A" stainless steel. This sliver-white metal is stated to resist nitric acid of any concentration and temperature. Moreover, it can be welded without the aid of other metals. The same and other firms produce an alloy called "Thermisilid," which, it is claimed, is able to resist the action of dilute sulphuric and hydrochloric acid and most organic acids as well. To protect the alloy against breakage Krupps encase articles made from it in steel and fill with lead the space between the steel jacket and "Thermisilid" body.

Another interesting exhibit was the "Taifun" stirring gear, which is constructed and works in the following ingenious manner:—To the walls of the mixer, above the stirrer, there are fixed curved baffle plates leading to the centre. As an ordinary stirrer is used, a hollow conical vortex of liquid is formed. The rotating liquid strikes the baffles, runs along them and then falls into the centre, thus producing an excellent intermixing effect. Apparatus for oxidation under pressure was also shown. Modifications of old ideas were to be seen on the stands of a rubber manufacturer. These were standardised ebonite pipes and bends, and a working model of an acid pump made of steel encased in ebonite. A notable feature was the section dealing with glass instruments, laboratory apparatus and fittings. Balances, microbalances, and optical instruments were offered; while calorimetric bombs made of new steel alloys, and effectivelydesigned apparatus of aluminium could also be had. One interesting "side-show" of the exhibition was the sale of technical books and journals. In Germany it is undoubtedly recognised that technical education is the mainstay of the country, and that the Press is probably the most important instrument which industry possesses for its development and maintenance; and, moreover, that it is the most powerful weapon with which to conquer the world's markets.

Signs of Progress

THERE is real encouragement to be found in the views expressed by several of the most prominent leaders of the chemical industry at the annual meeting of the Association of British Chemical Manufacturers, reported in this week's issue. We have often had to point out how much chemistry suffers in public influence from the fact that so little is known outside the profession and industry themselves of the wonderful part it plays in every branch of life. It has been too much consigned to a monastic fate by monastically minded types who regard any popular or public interest in their work as rather an impertinence. A decided movement is setting in in the opposite direction, and the best minds in the industry are recognising the need of systematic public education. Already, indeed, the work is in progress. Those who keep their eyes open must have noticed the effective way in which through different channels the public are being educated in the real meaning of a dyestuffs and fine chemical industry for the country. Public men like Sir William Pearce, who have frequently to explain chemical interests in Parliament, find their task greatly hampered by public ignorance of the subject. This difficulty will not disappear in a moment, but it will certainly yield to intelligent treatment, and if the attitude commended at the A.B.C.M. annual meeting is followed up by action, in a few years British chemistry may occupy a very much larger and better place in the public mind than it does at present.

Equally, the industry itself can only gain by a fuller exchange of ideas and experience between all engaged in it. The Association has had an excellent influence in this direction, and already it is widely realised that the policy of individual isolation costs those who practise it more than it saves. While individual initiative will, we trust, long remain one of our greatest British qualities, the chemical industry is, after all, a collective interest, and what is good for it as a whole is necessarily good for all its members. Germany and America have been a little ahead of us in the policy of pushing their industries on a national basis, and getting a good name for anything labelled "German" or "American." We have often started late and then overtaken and beaten our competitors, and if the policy of the Association is pursued for another five years we may expect to see a good measure of the present handicap wiped off. For the moment, at any rate, opinion is moving in a decidedly progressive direction.

Points from Our News Pages

Some impressions and opinions on his visit to this Country are published in an interview with Dr. R. F. Ruttan (p. 108).

A further instalment in our series of articles on the chemical markets of the world deals with trade opportunities in the Colonies (p. 111).

Some other points of view in connection with the "Nitre Pot *v.* Ammonia Converter" controversy are put forward by a technical correspondent (p. 115).

At the sixth annual general meeting of the Association of British Chemical Manufacturers Sir John Brunner and other prominent figures reviewed the present position and problems of British chemical industry (p. 118).

Mr. F. S. Lovick Johnson discusses the protection of metals from heat oxidisation (p. 120).

According to our London market report there has again been a satisfactory turnover in general chemicals, the prevailing tendency being upwards (p. 133).

Our Scottish Market Report characterises business as having been rather quieter during the week with a general steadiness of values (p. 135).

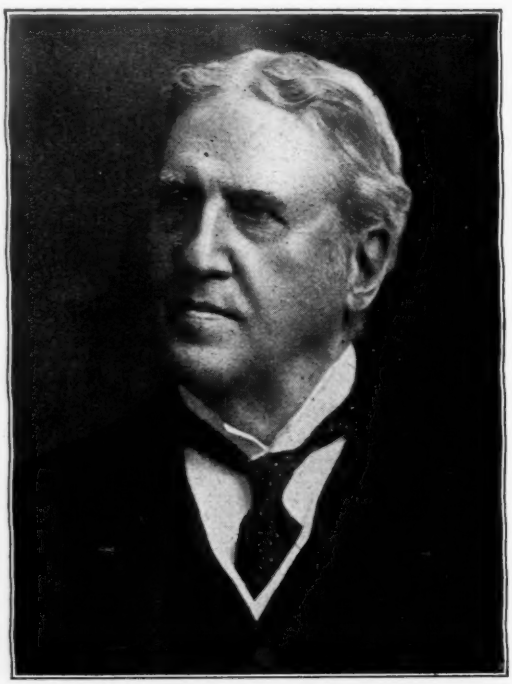
The Calendar

Aug. 12	The Mining Institute of Scotland: General Meeting.	Glasgow.
Sept. 4-9	American Chemical Society: Annual Meeting.	Carnegie Institute of Technology, Pittsburg, U.S.A.
6-13	British Association for the Advancement of Science: Annual Meeting.	City Hall, Hull.
20-22	Institute of Metals. Autumn Meeting.	Swansea.

Dr. R. F. Ruttan's Visit to England

Some Impressions and Opinions

DR. R. F. RUTTAN'S visit to this country, undertaken as president of the Society of Chemical Industry, closes on August 11, when he sails from Liverpool for Canada. Since his arrival in the latter part of June, he has spent a busy but a thoroughly pleasant time in making new acquaintances, in dealing with the business of the Society, and especially in connection with the Annual Meeting, over which he presided in Glasgow. It is safe to say that he will carry with him as well as leave behind entirely agreeable memories of his visit. Shortly after his return to London from Glasgow Dr. Ruttan was good enough to give us some of his impressions, which are reproduced below, of this year's Annual Meeting



DR. R. F. RUTTAN

"The outstanding characteristics," he stated, "of the Glasgow meetings were the emphasis placed on the social side of the meeting, and the hearty and genuine character of the reception given to the Society, both officially and privately; every member was made to feel that he was personally a welcome guest of the city. The accentuation of the social side of the meeting offers a marked contrast to meetings of a similar character on the American continent, where at least three days are devoted by the members to reading papers, with opportunities for meeting only casually at luncheon and during the evening. Excursions and receptions afford a much more effective means of bringing the executive of the Society into intimate contact with the members than formal luncheons or dinners, with their inevitable 'head' table. The example set by Glasgow in this respect is one which, I hope, will be followed in future meetings of the Society, and which might with advantage be followed on the other side of the Atlantic. Such meetings tend most effectively to unify the profession and to break down the walls of reserve and tradition now existing between academic chemistry and its economic applications. It was rather a surprise to me not to find the academic side of chemistry more fully represented; cross-fertilisation of the different chemical interests often yields valuable results.

Chemistry and Public Life

"The most important problem," he continued, "before the profession to-day within the Empire is to establish a feeling of consideration and respect for chemical opinion among those who guide the destiny of the nation, and in whose power lies the development of the industrial interests of the country. The Parliaments of the various units of the Empire are but the reflected images of public opinion. It is, therefore, fundamental to the interests of the profession to have behind it strong reserves of public opinion. To receive recognition by the Legislature chemists must be organised, active, and public-spirited. No class in the community is more interested in such national questions as technical education, the utilisation of waste products, the controlling and directing of the application of scientific methods to the development of industries and of the resources of the country. Members of no profession are so well qualified as are chemists to direct legislation along effective and economic lines. We chemists, as a body, are too much inclined to shut ourselves up in our own interests, whether academic or commercial. It seems time for the chemist to take a greater cognisance of public affairs and to assume an active part therein, no matter how much he may be tempted to go into his own laboratory and ignore the general interests of the profession to which he belongs. The chemist does not, either here or in Canada, fill the place of influence and leadership in his community to which his qualifications entitle him.

"The Glasgow meeting will go far towards developing a community of interest among those engaged in the application of chemistry to industries, but should not such meetings take some interest in a greater unification of the chemical organisations of Great Britain? Any movements, such as those suggested by Sir William Pope and Dr. Miall, which will tend to bring this about, should receive the hearty support of everyone interested in the development of the country. No plan, it seems to me, would produce more immediate results in unifying the profession than the establishment of a Chemists' Club in London where members of all the chemical societies could meet on an equal footing.

Greater Publicity

"The public might be brought to appreciate more fully what chemistry has done, and what it can do, by greater publicity. Articles in the public Press, providing popular but accurate information regarding the triumphs of modern chemistry, would go far towards influencing the electorate, and hence the views of the representatives in Parliament. One cannot avoid being impressed by the absence of cheap popular scientific magazines in England. Surely, the intelligent classes would be interested in the new discoveries of electricity, chemistry, biology, and mechanics, if these were presented in a way to interest the man in the street and well illustrated. In the absence of these popular magazines chemical supplements might be issued by the daily Press similar to the Engineering Supplement of *The Times*.

"To initiate effectively such publicity as would influence the general public and the heads of industries in the country a greater measure of co-operation among the chemical organisations seems to be necessary, but before it is possible to bring about co-operation the incentive to it must be

developed. The supreme necessity for a united profession of chemistry must be realised by chemists in every field of activity. The benefits resulting from co-operation, however, must call for the application of the self-denying ordinance. We must all concede something for the general good. I cannot believe that the goal is unattainable, but to reach it will take time and much patient effort.

A Suggestion

"May I make a suggestion regarding the conduct of our Annual Meeting? I believe in cutting down the reading of papers to one another to a minimum, but something of interest should replace this function of the meeting. The subject matter of the presidential address, if it should be a contemporary topic of general interest and importance, might be thrown open for discussion on the morning of the second day; or, and if preferred, a question of general interest to all members of the Society might be introduced by one or two and followed by an open debate. If the subject is carefully selected and announced on the programme it would prove a most attractive morning and form a topic of conversation throughout the meeting.

"The associations of the environment of the meeting at Glasgow and the history of my own Canadian University are peculiarly intimate. McGill University in Montreal was endowed and founded by James McGill of the City of Glasgow, who gave a large area of land, on what is now part of the city of Montreal, for the purpose of founding the University, while the first professors of that University were those in the Faculty of Medicine, graduates of Edinburgh University who, upwards of a hundred years ago, established the Montreal General Hospital and constituted the nucleus of the first Faculty in the new University. This meeting, then, in Glasgow and Edinburgh was of peculiar interest to the University of McGill, as well as to its Professor of Chemistry." F. E. H.

Reviews

CATALYTIC ACTION. By K. G. FALK. New York: The Chemical Catalog Company, 1922. Pp. 172.

This volume consists to a large extent of a discussion of the mechanism of catalytic action from a standpoint based on the formation of addition compounds. Undoubtedly many cases are to be found for which good grounds exist for postulating the existence of intermediate compounds of this nature, but the manner in which the presence of a so-called catalyst may conceivably accelerate, or depress, the velocity of a chemical reaction is so manifold that the successful development of a single theory of catalysis, which shall embrace all known cases, becomes yearly of increasing difficulty, even when assisted by the modern trend to regard "chemical" and "physical" influences, or modes of association, as differing in degree rather than nature. Probably some form of association between the catalyst and the system catalysed does occur in every case, since, without this association, the modification of conditions which underlies the catalytic effect could not be exerted; but so little is known of the nature of this association, save in certain ideal cases, that any discussion of catalysis from this standpoint is necessarily hampered by the absence of well-established results.

The catalytic processes considered in the book are almost exclusively of an organic nature, prominence being given to the theory of addition compounds in reactions such as the hydrolysis of esters and of the imido esters, in the light of the work of Stieglitz and others. Chapters are devoted to enzyme action, to the chemical aspect of life processes and to a short description of recent theories of chemical action, including the application of the radiation hypothesis.

Misprints and misstatements are relatively rare, this being also the case with the names of authors. Boltzmann, however, appears as "Beltzmann" in the index, and exception may perhaps also be taken to the statement on p. 30 that "innumerable" examples might be given of negative catalysis. The retarding of a reaction by a catalyst, apart from the distinct phenomenon of catalyst poisoning, is relatively rare, only a few isolated instances being known, some of which are given in the text.

It is interesting to note the author's conception of a catalyst as a body which takes part in a reaction by associating itself in a transitory manner with the components of the system, without necessarily changing the reaction velocity, any change in the speed of the reaction from its normal or uncatalysed value being considered to be a secondary effect.

On the whole, the book is a thesis on catalysis from an organic and physiological standpoint rather than a general textbook to which reference may be made for information, or for definite facts regarding a definite reaction. Books of this sort, provided that the speculative aspect is not too laboured, act as a mental tonic in that they stimulate new lines of thought, and, as such, have an important place in scientific literature E. B. M.

CATALYSIS WITH SPECIAL REFERENCE TO NEWER THEORIES OF CHEMICAL ACTION. London: The Faraday Society, 1922. Pp. 129. 9s.

The general discussions on various subjects held from time to time by the Faraday Society so frequently include contributions of the first importance that their reprint in a separate form almost invariably constitutes a convenient and authoritative summary of the contemporary position of the subject treated. This is especially so in the present instance, and the small volume just issued may well be read, and digested, by all who are interested in the newer theories of catalysis and of chemical action generally.

The subject has been divided into two main sections, dealing respectively with the radiation theory of chemical action, and with heterogeneous reactions. In the first of these, Professor Perrin contributes a highly important account of the reasons which led him to the recognition of the absorption of radiation as the source of chemical change, the subsequent development of the radiation hypothesis being also described. Much independent work along somewhat analogous lines has been done in this country by Professor W. C. McC. Lewis, who contributes an article dealing with the radiation theory of chemical reactivity. In each case the application of Marcelin's conception of the critical increment, as the fundamental condition for reactivity, has done much to shed new light on the mechanism of chemical change, and to explain the abnormal value of the temperature coefficient of chemical reactions, as an explanation of which Arrhenius long ago had introduced the conception of "active" molecules, accompanied by the evolution of an empirical equation, which subsequently proved similar in form to that derived on theoretical grounds from the radiation and quantum hypotheses. In this connection considerable interest is attached to Dr. Langmuir's suggestion on p. 600 (the reprint is numbered in accordance with the pagination of the original Journal) that the connection between radiation and chemical reaction may only be that each is manifested along parallel lines—based in each case on the conception of quanta—which, by reason of their statistical similarity, obey much the same mathematical relationships. Criticism such as Dr. Langmuir's statement that, in some cases, the *total* energy in all wave lengths is insufficient to bring about a given reaction, is of the nature which, on further investigation, either strengthens or overthrows a theory. A modified theory of chemical reactivity, based on the quantum theory, is advanced by Professor E. C. C. Baly, and contains many considerations of the highest importance. In particular,

it explains certain discrepancies pointed out by Langmuir and others, and lends itself to the explanation of absorption spectra. Professor T. Martin Lowry contributes a discussion of the possibility of a true monomolecular reaction, in which the general necessity for the presence of at least a minute quantity of a foreign body is emphasised.

The second part of the volume contains two papers by Dr. Langmuir on heterogeneous reactions, two processes, namely the combination of hydrogen and carbon monoxide, respectively, with oxygen at a platinum surface being treated in detail. Dr. Langmuir's work on adsorption and on the mechanism of surface phenomena has done much to clear up what was hitherto a rather obscure and speculative field, and these two additional papers contain much that is new and interesting. Professor Svante Arrhenius and Professor F. A. Lindemann, in addition to a number of well-known investigators from this country, contributed to the general discussion which followed the main papers.

It is seldom that a book can be recommended as wholeheartedly as this volume.

E. B. M.

THE SCIENCE AND PRACTICE OF SCOURING AND MILLING IN THE WORSTED AND WOOLLEN INDUSTRIES. By JOHN SCHOFIELD, B.Sc., A.R.C.Sc. Huddersfield: Netherwood, Dalton & Co. Pp. 231.

The technical operations named in the title of this small volume are concerned with the cleansing of woven and knitted materials by means of soap and alkali, and with the felting of the fibres of such materials suitably prepared by the action of soap or other solutions. A real insight into the subject, therefore, demands a fairly extensive knowledge of the chemical and physical properties of wool and of the various substances accompanying it when it reaches the scourer, of soaps and other detergents in relation to properties of wool, and requires, in addition to some knowledge of the mechanical principles of the machinery used, an acquaintance with numerous details which have been evolved by the rule-of-thumb methods of the industry.

The author has tackled his subject with praiseworthy ambition, and has succeeded in demonstrating the varied nature of the problems presented by it. The performance is, however, far below that necessary to produce a good book. We may comment on the following points in order to assist the author to achieve his commendable objects in a revised edition.

(1) The addition of an index.

(2) The uniform insertion of references to journals in cases where the names of authors are given.

(3) References in the text to figures should state the pages on which the figures appear, and figures should not appear without some reference in the text.

(4) Some of the chemical equations should be corrected (*e.g.*, on pp. 3, 23, 47, 216) as well as statements such as "caustic soda . . . is marketed . . . as 77/78 per cent. powdered salt"; "sodium carbonate . . . $Na_2CO_3.10H_2O$. The bicarbonate of soda is the druggist's form"; "Sodium Oleate $C_{71}H_{33}COONa$, has a molecular weight of 304. Oleic and Stearic acids have very approximately the same molecular weights, and are monobasic"; "Glycine forms a sodium salt CH.NH.COONa and a hydrochloride HCl.NH.CH.COOH."; "The active agents are the COH.N groups"; "Aluminium . . . is practically incorrodible, being very little acted upon by dilute solutions of the common acids or alkalies or the fatty acids."

(5) A paragraph on p. 31 is out of place.

(6) The calculation on p. 50 contains errors.

(7) Osmotic pressure can hardly be dismissed so summarily as "being due to a striving of the particles of the dissolved substance to permeate the whole solution."

(8) The sketch of the Soxhlet apparatus is incorrect.

(9) There are numerous other minor inaccuracies.

(10) The worst fault of all is the cursory treatment of many subjects which, if not already understood by the reader, will not be grasped as a result of reading the book.

C. A.

Estimation of Calcium Carbonate

To the Editor of THE CHEMICAL AGE.

SIR,—May I suggest for the criticism of your readers the following means of estimating the percentage of $CaCO_3$ in a mixture of $CaCO_3$ and CaO, such as commercial lime.

Having previously estimated the siliceous matter in a thoroughly slaked and dried sample, weigh about 5 grams of the same sample, and dissolve in a slight excess of $\frac{N}{1}$ Hcl. When complete solution has taken place, titrate the excess acid with $\frac{N}{1}$ caustic soda, and using phenolphthalein as indicator. The percentages of $CaCO_3$ and CaO may be determined from the following equations:

Let M = percentage CaO.
Let N = percentage $CaCO_3$.
Let S = percentage siliceous matter etc.
Let t = number of cc of acid used.
Let W = weight of sample used.

Then $M + N + S = 100$

and $$\left(\frac{M}{100} \times \frac{W}{.037}\right) + \left(\frac{N}{100} \times \frac{W}{.05}\right) = t$$

whence M and N may be obtained by ordinary algebraical processes.

The factor for the lime is 0.037 because it is hydrated ($Ca(OH)_2$). Yours, etc.,

14, Court Road, West Norwood, London. K. TIDDY.

The Fine Chemical Industry

To the Editor of THE CHEMICAL AGE.

SIR,—With reference to your article dealing with the Board of Trade Returns for June, it seems to me that these figures demonstrate more vividly than a thousand pamphlets the far-sightedness of the policy of setting up a fine chemical industry in Great Britain because they show a remarkable falling-off in the quantity of chemicals imported into this country during the first six months of the present year. The classification is so general that it is difficult to dissect it, but, so far as one can do so, it appears that the total value of fine chemicals, exclusive of dyestuffs, is just over three-quarters of a million pounds sterling, a decrease of close upon one and a quarter million pounds compared with the like period last year; of almost three and a quarter millions compared with the first half of 1920.

There is only one inference to be drawn from that progressive decline in the quantity of fine chemicals bought abroad. Even after we make all due deductions for the trade slump, the figures confirm a general impression gained from fine chemical makers that Great Britain is slowly yet steadily breaking away from her reliance upon foreign countries. The fine chemical industry is just beginning to feel the benefit of the Safeguarding of Industries Act; until now the large importation of chemicals which took place before the Act came into operation has held up the British manufacturer. At last, however, the British manufacturer is on his mettle, not only at home, but abroad. During the last six months he has actually exported very much more than during the corresponding period of last year, although not as much as in the year before that, owing to the slump in trade.

What is the significance of this? It means that we are surely becoming producers of fine chemicals rather than mere merchants of them. Incidentally, it means a field for the employment of some of the thousands of young chemists coming from our universities and colleges, and a welcome widening of scientific research. It means that never again need Great Britain place herself at the mercy of any foreign rival.—Yours, etc.,

House of Commons, S.W.1. W. J. U. WOOLCOCK.

The Chemical Markets of the World

Trading Fields for Manufacturers and Merchants

We give below a further specially prepared collection of notes relating to overseas markets for chemicals, dyes and drugs. The present instalment deals solely with the Colonies which, alone, offer almost unlimited possibilities to the United Kingdom exporter. The marked Colonial preference for British goods makes this group of markets particularly worthy of fuller cultivation. Acknowledgment is again made of the valuable assistance rendered by officials of the Department of Overseas Trade in the compilation and verification of these notes.

South Africa

THE market for chemicals in South Africa may be regarded as comprising demands for two distinct classes: mining chemicals and pharmaceutical chemicals.

MINING CHEMICALS.—The importance of the mining industry renders it a noteworthy factor in the requirements of the market. The mines buy their requirements almost entirely from local merchants or agents who carry stocks. Recent industrial troubles on the Rand have, of course, had a disturbing effect, but the reduction in the costs of production likely to follow will, no doubt, benefit the industry in the long run. In some instances, notably explosives, locally manufactured products supply the bulk of the requirements. The following figures show the value of certain of the stores consumed during 1920 :—

	South African (including Rhodesian) Products.	Foreign Produce.
	£	£
Calcium carbide	1,496	133,393
Chemical and assay and smelting requisites	88,444	66,589
Cyanide	—	376,271
Disinfectants	5,548	19,475
Explosives:		
Blasting Gelignite	142,401	—
Gelignite and Gelatine Dynamite	1,243,740	—
Dynamite and Ligdyn	210,715	—
Other explosives	17,875	231
Lime (a) white	144,194	—
(b) blue	5,468	—
Soda	1,807	2,656

PHARMACEUTICAL CHEMICALS.—These are imported very largely from this country. The trade is done by wholesale chemists, some of whom have their own buying offices in London, whilst others buy through the ordinary manufacturers' commission agent, orders being confirmed by United Kingdom buying agents.

Import Trade

As has been indicated, the United Kingdom holds a very satisfactory position in the majority of lines. The following figures show the value of some of the more important imports during 1921 :—

	From U.K.	Total.
	£	£
Calcium carbide	—	39,325 (Canada £17,045)
Caustic soda	34,417	39,358
Cyanide of sodium	326,070	326,679
Disinfectants	47,274	48,884
Arsenite of soda	25,430	25,430
Medicinal preparations:		
(Spirituous)	19,690	28,932
(Non-spirituous)	118,807	153,425

Imports from the United States are of a fair value in certain cases, but her share of the trade is small compared with the part secured by the United Kingdom.

Local Production

Reference has already been made to the importance of the South African explosives industry. Fertilisers and dips, sprays, etc., are also produced in large quantities, the Cape Explosives Factory working on Christmas Island rock being claimed to be the second largest superphosphate works in the world. Other local manufactures include sulphuric, nitric and hydrochloric acids, bleaching powder (chloride of lime), sulphate of soda, sulphate of alumina, manganate of soda, silicate of soda, bisulphite of soda, ferrous sulphate, copper sulphate, etc. The value of the output of factories engaged in the manufacture of drugs, chemicals (including fertilisers and by-products), paints, varnishes, and allied products, amounted in the year 1919-20 to £7,245,765, but probably only a small proportion could be considered as chemicals.

The value of some of the products during that year was: Glycerin, £38,616; soda crystals, £15,165; fatty acids, £163,307. It may be added that soap to the value of over £1,600,000, and candles worth over £1,000,000 were also produced in the same year.

The exports of chemicals are small.

India

The off-take of chemicals and chemical preparations, excluding chemical manures and medicines, has recently averaged over two million sterling per annum, 75 per cent. of which was exported from the United Kingdom. This satisfactory figure is, of course, partly due to increased prices over the pre-war basis, but is also attributable to the development of Indian industries and the increased demand which would appear likely to continue for many years. British trade has held its own in the market and has regained the pre-eminent position occupied before the war. Competition, however, is keen both from America and Japan, which latter country has displaced Germany as our foremost competitor in India.

India herself is now taking steps to manufacture many of her own requirements, and it is probable that she will soon be independent of overseas supplies of the key products of her chemical industries. The manufacture of essential oils and alkaloids is also being pushed forward.

This development of India's natural resources should be welcomed by the mercantile community, as by increased prosperity in India the standard of living and comfort will be raised, with a consequent increased demand for high-grade products, which are so largely manufactured in Great Britain.

To analyse briefly the main headings of the market: Tartaric, nitric, sulphuric, and carbolic acids are mainly obtained from this country, though the imports of sulphuric acid have tended to decline, owing to increased manufacture in India.

Bleaching materials, consisting almost entirely of bleaching powder, are now derived to the extent of 80 per cent. from this country, imports from Japan having fallen very largely since the war. Soda compounds are bought practically exclusively from England. Sulphur, which was imported to the value of £224,893 in 1920-21 and which is largely used for the manufacture of sulphuric acid, is obtained chiefly from Japan, a small percentage coming from Italy.

About half the importation of potassium compounds comes from Great Britain, the remainder being supplied by Japan, Italy and Sweden. India is a big market for disinfectants, the majority of which come from this country.

Australia

For the British manufacturer of chemicals and allied lines, Australia represents a market of no little importance. In the year ended June 30, 1921, the value of commodities imported into the Commonwealth classed as drugs, chemicals, and fertilisers, amounted to £5,587,575 out of a total value of imports of £163,801,826. In the preceding year the corresponding figures were £3,648,755 and £98,974,292 respectively.

The United Kingdom held a satisfactory position in most lines, being the country of origin of the larger portion of the imports under each of the following among other headings: Acids (boric, citric, phosphoric, tartaric, etc.), ammonium chloride, bismuth salts, calcium chloride, cyanides of potassium and sodium, large numbers of drugs and medicinal preparations, dyes, arsenical washes and dips, refined glycerin, many non-spirituous essential oils, perfumery, sodium salts (bi-borate, bi-carbonate, carbonite, hydroxide, silicate, sulphide, etc.), spirituous preparations (including essences, flavours, perfumed spirits, etc.).

Competition from the United States is chiefly manifest in salicylic acid, bacteriological products and serums, bromine and bromides, cream of tartar, proprietary medicines, and various drugs and medicinal preparations not specifically mentioned, naphtha, perfumery and toilet preparations, sodium hydroxide and certain other sodium salts, and brimstone sulphur.

France furnishes the largest share of the cream of tartar and unrefined glycerin, and also contributes an important part of the perfumery, toilet preparations and perfumed spirits imported. Calcium carbide comes from Norway, and Japan sends a fair proportion of the sodium sulphide. Of the fertilisers, guano and rock phosphates are procured from the Pacific Islands, and sodium nitrate from Chile.

The bulk of the import trade is done through the large merchant houses, sales being stimulated in many cases by the appointment of local representatives. Australian feeling shows a marked preference for British goods where the locally manufactured article is not available.

Local Production

The policy of the Australian people and the Commonwealth Government is to develop their manufacturing industries, and although the chemical industry is not as yet, perhaps, one of the most important, it is a growing one, and its output deserves consideration. The following figures for the year 1919-20 may be of interest:—

	Factories.	Hands.	Value of Output. £
Chemicals, drugs and medicines	132	3,232	2,862,992
Fertilisers	20	1,251	1,762,424

The majority of the factories are in New South Wales and Victoria, but enterprise is being shown in the establishment of chemical industries in other states. Protection is afforded where necessary by means of heavy Customs duties, or even on occasion by temporary prohibition of importation. The establishment of branch factories of British firms in Australia is thus encouraged. As an instance, may be quoted arsenical sheep dips, the requirements of which are now very largely met by local production. In a similar way efforts are being made to place the manufacture of carbide of calcium in Tasmania upon a satisfactory basis.

Export Trade

It is an index to the prosperity of the Australian industries concerned that in the year ended June 30, 1921, the value of exports from the Commonwealth of Australian productions classed as drugs, chemicals, and fertilisers amounted to £914,950. This figure is exclusive of re-exports valued at £129,406. In addition to such a typical Australian product as eucalyptus oil (£107,112) there were considerable exports of locally produced anhydrous ammonia (£44,318), casein (£28,069), medicines (£95,940), and perfumery (£18,416). Fertilisers exported included ammonium sulphate (£160,017), superphosphates (£153,058), bone dust (£40,926), and rock phosphates (£25,738), whilst insecticides, sheepwashes, and disinfectants accounted for £30,408.

Customs duties are framed largely for protective purposes and vary considerably, British products being in some cases admitted free, and in others charged duties ranging up to 30 per cent. In many instances a specific duty by weight is levied.

New Zealand

New Zealand is almost entirely dependent on its import trade for supplies of chemicals, drugs and druggists' sundries, as well as chemical manures and fertilisers. Although a relatively small market, it is one worthy of careful consideration by the United Kingdom exporter owing, to a great extent, to the exceedingly high purchasing power per head of the population. In this connection it is a remarkable fact that a country having a population of a little over one million people, absorbed in 1919 imports of all classes of goods to the value of £30,671,698, in 1920 (which was, for many reasons which cannot be entered into here, an abnormal year), to the value of £61,595,828, and in 1921 to the value of £42,942,443. Another factor which should commend itself to British firms considering the possibilities of the New Zealand market, is the intensely patriotic sentiment so generally prevalent among importers and consumers alike. It is a fact that in almost all cases a New Zealand importer will, other things being equal, purchase his supplies from the United Kingdom whenever possible, and even in cases where the cost of the United Kingdom article is slightly higher than that of the foreigner, he will in many cases decline the latter in favour of the former. This feeling in favour of preference to British manufacturers is as strong among importers of chemicals and druggists' wares as in any other section of the trading community.

Local production of chemicals is small. There are a few firms manufacturing chemical manures such as ammonium sulphate, as well as sulphuric, muriatic and nitric acids. Various by-products from the distillation of coal-tar are produced, such as naphtha and wood-preserving chemicals. An insecticide, consisting mainly of sulphate of copper and lime, is also manufactured. Exports of chemicals, drugs etc., are practically negligible. In 1920 the exports of this class of commodity, being the produce of the Dominion only, amounted in value to £5,324, of which £1,011 represented exports of gas liquor or ammoniacal liquor, mainly to Australia.

With regard to the channels through which the import trade is carried on, it may be said that the importation of chemicals and drugs generally is in the hands of three or four principal wholesale houses, carrying stocks, although a number of smaller concerns import to a lesser extent; while special lines, such as toilet preparations, sheep-dips and proprietary lines are frequently entrusted to the hands of agents. In addition to the general importers of chemicals and drugs, there are a number of woollen mills importing their dyes direct, and tanneries importing the chemicals required in connection with the tanning industry. It should be mentioned also that chemical manures and fertilisers for the use of farmers and others are imported to a considerable extent by the farmers' co-operative associations and the stock and station agents.

The following tables show the value of imports into New Zealand of chemicals, drugs and druggists' wares, as well as

manures, including chemical manures and fertilisers, during the years 1919 and 1920, together with 1914 for purposes of comparison :—

CHEMICALS, DRUGS AND DRUGGISTS' WARES.

Countries of Origin.	1914*. £	1919. £	1920. £
United Kingdom	319,822	488,446	682,989
Australia	151,507	201,885	252,958
Canada	4,634	19,703	14,548
United States of America	43,404	280,075	363,891
Japan	2,434	47,243	18,770
Other Countries	117,237	62,102	149,016
Totals	639,038	1,099,454	1,482,172

* Imports from Germany in 1914 amounted to £40,432

MANURES.

Countries of Origin.	1914*. £	1919. £	1920. £
United Kingdom	126,425	14,848	60,502
Australia	102,293	153,794	299,430
Canada	—	—	25
United States of America	1,971	88	147
Japan	24,526	—	73,716
Other Countries	256,978	150,890	325,786
Totals	512,193	319,620	759,606

* Imports from Germany in 1914 amounted to £143,362 (chiefly potash manures and basic slag).

Foreign Competition

Detailed statistics showing the imports of various chemicals in 1921 are not yet available. During the year 1920, however, the United Kingdom supplied the bulk of the imports of boracic and carbolic acids, alum, ammonium chloride, borax, calcium chloride, cyanides of potassium and sodium, saccharine saltpetre, soda ash, soda bi-carbonate and carbonate, strychnine and salts, as well as disinfectants and sheep-dip. Among the classes of chemicals in which American competition was most strongly felt in 1920 by United Kingdom suppliers may be mentioned acetic acid, cream of tartar (also largely imported from France and Italy), dyes, sera and vaccines, soda acetate, nitrate of soda and soda silicate.

Australia shared with the United Kingdom the bulk of the trade in sulphate of copper for insecticides, cattle and horse drenches and licks, phosphorus, ammonium sulphate and sulphate of iron. Australia also supplied imports under the headings nitric, muriatic and fluoric acids, sulphuric acid, arsenic, glycerin (refined) and anhydrous ammonia. Calcium carbide was imported mainly from Norway and to a lesser extent from Canada. The United States supplied the bulk of the sulphur imported, smaller quantities coming from Japan. Arsenates were also imported principally from the United States. Among the chemical manures not already referred to may be mentioned sulphate of ammonia and sulphate of iron from Australia and the United Kingdom, and nitrate of soda from Chile. The greater portion of the manures imported consist, of course, of phosphates, including basic slag and Thomas phosphate from the United Kingdom and Belgium, and superphosphates from Australia and Japan.

Increased British Preference

With regard to the New Zealand import tariff, it should be mentioned that a large number of drugs and chemicals, including most acids, are admitted free. At the same time an increased British preference is granted in the new tariff (December 22, 1921) to certain lines, such as acetic acid, chloroform, acetic ether, ether purificatus, sulphuric ether, iodoform, carbonic-acid gas, naphthalene, saccharin, etc. Importations of cream of tartar and substitutes will be admitted free up to and including December 31, 1922, after which date imports under the British preferential tariff will still be admitted free, while supplies from foreign countries will be dutiable under the general tariff at 20 per cent. *ad valorem*. An intermediate tariff at 10 per cent. *ad valorem* is also laid down for use in the event of reciprocal arrangements being made with any countries normally coming under the general tariff. It should be added that imports of all classes of chemicals and drugs are subject to a primage duty of 1 per cent.

In order that United Kingdom firms interested in the export of particular chemicals may be able to gain, at a glance, an idea of the relative volume of New Zealand's annual demand for the different classes, the following table has been prepared showing the values, and where possible the amounts, of drugs, chemicals, druggists' wares and manures imported during the year 1920 :—

IMPORTS INTO NEW ZEALAND OF DRUGS, CHEMICALS AND DRUGGISTS' WARES IN 1920.

Description.	Quantities.	£
Acetic Acid	230,008 lb.	5,528
Boracic Acid	123,533 lb.	4,958
Carbolic Acid	15,345 lb.	849
Nitric, Muriatic and Fluoric Acid	136,636 lb.	3,150
Salicylic Acid	2,343 lb.	511
Sulphuric Acid	506,450 lb.	4,494
Tartaric Acids	245,266 lb.	44,861
Other Acids	98,529 lb.	13,400
Alum	2,673 cwt.	2,709
Ammonium Chloride	—	2,331
Arsenates	540 cwt.	3,578
Arsenic	1,003 cwt.	3,384
Baking Powder, etc.	—	1,110
Borax	2,296 cwt.	6,107
Calcium Carbide	898 tons	23,337
Calcium Chloride	—	2,708
Chemicals and Chemical Preparations, not otherwise enumerated	—	18,710
Cream of Tartar	1,352,012 lb.	133,079
Cyanide of Potassium and of Sodium	147 tons	20,343
Dyes	—	102,909
Glycerin, refined	—	8,246
Gum arabic, etc.	—	11,835
Disinfectants	—	43,826
Insecticides and tree washes—		
Denatured red oils	17,251 gal.	3,666
Sulphate of copper	1,409 cwt.	3,710
Other washes, etc.	—	21,758
Cattle and Horse Drenches and Licks	—	3,442
Sheep-dip	—	80,738
Anhydrous Ammonia	—	34,276
Other liquefied Compressed Gases	—	22,599
Medicinal Barks, Leaves, etc.	—	11,801
Medicinal Preparations n.o.e.	—	431,152
Medicinal Preparations over 50 per cent. p.s.	29,664 lb.	11,629
Essential Oils (non-spirituous) :—		
Eucalyptus	19,780 lb.	4,830
Other	—	29,682
Opium	587 lb.	708
Perfumery	—	174,291
Phosphorus	—	1,446
Potash n.o.e. and Caustic Potash	52 cwt.	688
Saccharin	41,741 oz.	4,040
Saltpetre	2,650 cwt.	8,715
Sera and Vaccines	—	4,264
Soda Ash	20,541 cwt.	8,942
Soda Bi-carbonate and Carbonate	13,877 cwt.	8,540
Soda Caustic	20,471 cwt.	46,208
Soda Crystals	26 cwt.	22
Soda Nitrate and Acetate	4,721 cwt.	6,754
Soda Silicate	6,053 cwt.	5,330
Sponges	—	1,257
Strychnine and Salts of Strychnine	—	2,017
Sugar of Milk	—	37,678
Sulphur	83,291 cwt.	25,919
Vanilla Beans	10,279 lb.	3,604
Other Chemicals, etc.	—	20,503

IMPORTS INTO NEW ZEALAND OF MANURES IN 1920.

Description.	Quantities.	£
Ammonia, Sulphate of	772 tons	26,572
Nitrate of Soda	659 tons	14,066
Phosphates and Superphosphates	127,424 tons	696,737
Potash Muriate, Sulphate, etc.	907 tons	16,366
Sulphate of Iron	63 tons	692
Other Manures	1,538 tons	5,173

Canada

Canada is now buying about 30 million dollars' worth of drugs, dyes, and chemicals annually, 24 millions of which come from the United States.

Industrial chemicals are imported by brokers and wholesalers and also by the factories, etc., using the same. Manufacturers of indiarubber, fertilisers, ink, paints, iron and steel, and others often buy direct through the manufacturers' commission agents. This country still leads in the supply of cyanide of potassium and similar reducing agents used in mining. Manufacturing chemists, and wholesale druggists import pharmaceutical and other chemicals, also usually through commission agents.

Keen Competition

Competition is very keen over the whole field from United States and Canadian manufacturers. The Canadian industry made progress during the war. At Shawinigan the world's largest glacial acetic acid plant was built, a new process beginning with acetylene being developed. Acetone, paraldehyde, crotonaldehyde, mercuric oxide and manganese acetate are also produced there. The demand for acetic acid and acetone for war purposes stimulated the wood distillation industries; acetic anhydride, methyl acetate, etc., etc., were also produced. Salicylic acid and the acetyl derivative, benzoic acid, and many other chemicals are now made in Canada. The distillation of coal tar is carried on more extensively, producing various disinfectants, creosote, etc.

Several new acid plants have sprung up, and facilities for the production of sulphuric, nitric and mixed acids are largely increased. Soda ash is now also manufactured in Canada, as well as molybdic acid, chlorates of soda and potash, phosphates, etc. The paint and varnish industry is a strong one in Canada, and is producing also zinc oxide for the rubber trade.

A Growing Market

The development of hydro-electric power, in which Canada's vast resources have as yet hardly been touched, will doubtless go to the building up a great Canadian chemical industry. The necessity for chemicals in every line of industry, including agriculture, and the industrial development of the country, means that the market for chemicals will steadily grow, and also that the chemical industries will develop in direct proportion to the increase in general business and population.

To sell successfully in this market British manufacturers will have to pay special attention to it, in the way of local representation and support of sales, together with more publicity. In many lines goods are ordered in small quantities and are required urgently. This necessitates the carrying of local stocks. Many American manufacturers have opened warehouses in Toronto and Montreal, thus ensuring quick delivery. A combination of several manufacturers of non-competing lines for the purpose of opening a warehouse is a suggestion worth consideration. The manufacturer without local stocks is likely to lose business. In chemicals, at any rate, Canada is a buyers' market.

Work of the Federal Council

THE Federal Council of Pure and Applied Chemistry have appointed a Committee consisting of Sir William Pope, Dr. E. F. Armstrong, Dr. Stephen Miall, Mr. E. V. Evans, Mr. Emile Mond, and Mr. W. J. U. Woolcock, M.P., to raise a fund for entertaining the foreign delegates at the meeting next year of the Union Internationale de la Chimie Pure et Appliquée, for furthering the interests of chemists and for forming a nucleus towards the sum required for the development of chemical societies and clubs.

Sir Joseph Thomson Honoured

A Pioneer of Science

ON Wednesday, at the Department of Scientific and Industrial Research, London, the Franklin Gold Medal of the Franklin Institute, Philadelphia, was presented to Sir Joseph J. Thomson, " for signal and eminent service in science."

The presentation was made by Lord Balfour in the presence of a numerous company of distinguished scientists. The Royal Society was represented by Sir Charles Sherrington (president), Sir David Prain (treasurer), Mr. W. B. Hardy. (secretary), Sir Aubrey Strahan, and Professor A. Harden. There were also present Professor R. F. Ruttan, Dr. Elwood Hendrick, Professor T. H. Godspeed, of Berkeley, Professor W. G. MacCullum, of Baltimore, Sir William McCormick, Professor J. B. Farmer, Sir George Beilby, Sir R. Threlfall, Professor S. Young, Sir J. F. C. Snell, Professor J. F. Thorpe, Sir H. Miers and Sir Frank Heath.

Lord Balfour said that in honouring Sir Joseph Thomson the Franklin Society had not merely conveyed a signal sense of their estimate of Sir Joseph's merits as an individual, but they had conferred an honour upon the country where he was born and where he had done all the great work that had given him the distinguished place he occupied without contest among the scientific celebrities of the world. Within the last decade physical research had penetrated into regions never hitherto explored, and he well remembered that Lord Kelvin, who had himself done so much to prepare the new epoch, was nevertheless almost shocked by some of the theories which had now been accepted universally as representing the most recent advances in physical science. One of the greatest of pioneers in this greatest of scientific movements was Sir Joseph Thomson. What he had done in physics, in electricity as a department of physics, in the structure of the atom, in all those investigations which were proving day by day more and more fruitful, which were opening up such astonishing and unimagined vistas into the truths of nature, and the full importance of which only future generations would be able adequately to estimate—to all these great performances it would take far more time than they had at their disposal, and far more knowledge than he (Lord Balfour) pretended to possess, to do anything like justice.

Sir Joseph Thomson said there was something besides a personal element in the bestowal of that honour—there was a contribution to the brotherhood of science between America and Britain. He valued especially the association of the medal with the name of Franklin. He knew nothing quite analogous to Franklin's achievement in scientific history, for he obtained his immortal position practically by six years' work. He did it by sheer force of intellect, and he came to it without any scientific training.

Beit Research Fellowship

THE Trustees of the Beit Scientific Research Fellowships have re-elected Mr. H. L. Riley and Mr. W. A. P. Challenor to Fellowships for the year beginning September, 1922, and also elected Mr. H. W. Buston to a Fellowship for the same period. All the Fellows are required to carry out their research at the Imperial College of Science and Technology. Mr. Riley, who is an Associate of the Royal College of Science, and a graduate of the University of London in Chemistry with First Class Honours, will continue his research on " The Atomic Weight of Silver, and the Dielectric Constants of Dry Gases " in the Chemistry Department of the College, under the supervision of Professor Baker. Mr. Challenor, who comes from Birmingham, where he obtained the M.Sc. degree, will continue his work on " Ring Formation in the Aromatic and Aliphatic Series of Organic Chemistry," also under the direction of Professor Baker, in the Chemistry Department of the College. Mr. Buston, the new Fellow, is an Associate of the Royal College of Science, and holds the Diploma of Membership of the Imperial College, and will carry out investigations on " Nitrogenous Metabolism in Plants " in the Biochemistry Department of the College, under the supervision of Professor Farmer.

Relative Merits of Nitre Pot & Ammonia Converter

Some Other Points of View

By "Questor"

In a contemporary journal some years ago, when the relative advantages and disadvantages of the potting of nitrate of soda and sulphuric acid were being contrasted with the production of oxides of nitrogen via the ammonia oxidation process, the following financial statements were furnished as elucidating the pecuniary aspect:—

Cost of Production of Oxides of Nitrogen (Old Method).

	£	s.	d.
11½ cwt. pure nitrate of soda = 12 cwt. of 96% $NaNO_3$ at 23s. per cwt.	13	16	0
16 cwt. of 70% sulphuric acid at £4 8s. 1d. per ton ..	3	10	6
Interest and depreciation, 12½% on £200 = per week ..	0	10	0
Cost of nitre pots, trays, fittings, pipes, etc.	0	10	0
	£18	6	6
Credit.			
14½ cwt. nitre cake at 7s. 6d.	0	5	5
	£18	1	1

Cost of Production of Oxides of Nitrogen, *via* the Ammonia Oxidation Process.

	£	s.	d.
*2·75 cwt. of ammonia at 11s. 6d. per unit, *i.e.*, £57 10s. per ton	7	18	2
Cost of operation plant, three intelligent women at £2 2s. each	6	6	0
Steam and cooling water, etc.	1	0	0
Interest and depreciation, 12½% on £200 = per week ..	0	10	0
Renewals, repairs and maintenance	0	5	0
	£15	19	2

**N.B.—The ammonia equivalent of 11½ cwt. of pure nitrate of soda is* $\frac{11{\cdot}5}{5}$ *= 2·3 cwt. of ammonia, and assuming an 85 per cent. efficiency, this would necessitate the employment of, say, 2·75 cwt. of ammonia.*

It is important that the basis of the foregoing financial statement should be stated before dealing with the altered conditions which have arisen as a result of the efflux of several years, and the additional knowledge and experience which have been accumulated in the interim.

A sulphuric acid works producing 84 tons of monohydrated sulphuric acid per week was taken as a suitable unit of plant for comparison purposes, and it was assumed that a 95 per cent. efficiency was possible from the point of view of acid manufacture, and that the consumption of nitrate of soda would be 2 per cent. on the sulphur equivalent of the acid produced. Thus 28·87 tons of pure sulphur would be required, and this would represent the use of approximately 11½ cwt. of nitrate of soda per week, given a 96 per cent. yield from the point of view of the potting process.

It is seen that the technician responsible for the submission of the financial statements in question contemplated several considerations, and it is not imagined that many will be inclined to cavil with the figures presented, or to doubt the general impartiality evinced.

It is submitted to-day that careful regard should be had to the several items constituting the foregoing pecuniary comparison.

The article appearing in your issue of June 24 on the above subject can be best dealt with by considering the special aspects raised therein in seriatim order.

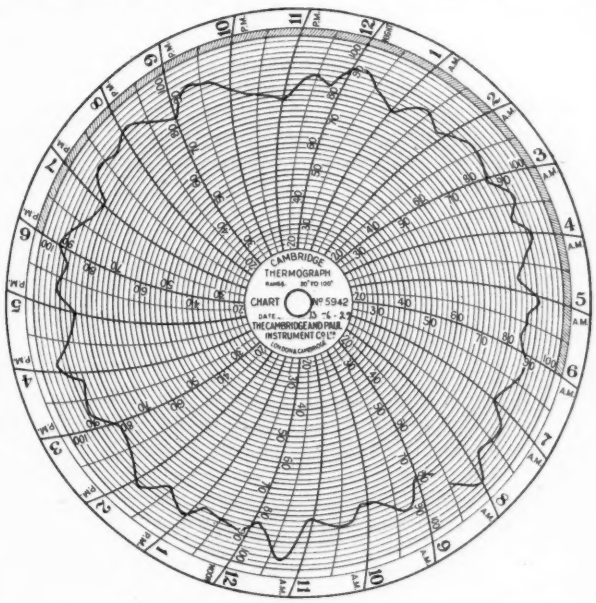
Relative Costs—Materials

The purport of your contributor's first sentence under this heading is somewhat vague. Presumably, he implies that the market relationship of nitrate of soda and ammoniacal nitrogen (at the moment in favour of ammoniacal nitrogen) will become increasingly advantageous with the lapse of time.

In the writer's view this prediction is open to doubt. Conditions are not yet normal in the agricultural domain, and this applies equally to the production of many ammoniacal products. Examination of the relative prices of nitrate of soda and sulphate of ammonia for the last forty years (excluding abnormal periods) will reveal that there has been a tolerable relationship between the nitrogen unit price of the two materials.

It is not inconceivable that future developments will be such as to maintain within reasonable limits the same unit price. To this aspect further reference will be made later.

Your contributor refers to 25 per cent. ammonia liquor as costing to-day £14 per ton at the sulphuric acid works. It must not be assumed that all acid works are makers of ammonia liquor. Many will have to purchase this product, and carriage will be involved. Further, what is one to



Continuous Record Chart, Showing Temperature of Inlet Gases to No. 1 Chamber—Sulphuric Acid Plant.

understand by the term "ammonia liquor"? Judging by the price, which represents 11·2 shillings per unit of ammonia, one can only assume that concentrated ammonia liquor is referred to. It has been found in practice that the use of concentrated ammonia liquor introduces several disturbing conditions to the operation of an ammonia oxidation plant, and involves the constant attendance of fairly skilled process workers if a conversion of 85 per cent. is to be secured. The disturbing conditions referred to may be briefly stated thus:—(*a*) It is impossible to obtain a dry ammonia-air mixture with concentrated ammonia liquor without deposition of ammonium carbonate and/or carbamate occurring, which ultimately causes a "choke" and must be removed. (*b*) If the plant is to be so operated as to avoid a blockage, then the ammonia-air ratio is disturbed, due to steam and carbonic acid, etc., and the conversion efficiency suffers, except there is fairly constant attendance and keen control. Thus such labour costs will wipe out the saving indicated by your contributor.

The assumption that pure liquor ammonia is implied would appear unjustified. The price of 920 liquor ammonia

was quoted last week in one trade journal as £16 10s. per ton, representing 15·3 shillings per unit, and in another journal an average price of £22 was named, representing 20·4 shillings per unit of ammonia. The writer would suggest that a fair price for pure liquor ammonia to-day in quantities such as would be required by an average-sized sulphuric acid works reasonably adjacent to the ammonia producing works would be 15s. per unit of ammonia. Calculating on this basis, the direct saving is only £2 12s.

Running and Capital Costs

Whilst it is agreed that a certain amount of labour is involved in potting, it must be conceded that the burner-men invariably do this work, and if the potting operation is dispensed with, a works manager would probably be inviting trouble to suggest a reduction of the burner-men's wages by reason of the somewhat reduced service entailed. On the other hand, the burner-man is not a suitable type of man in whom to repose the control and supervision of the ammonia oxidation plant.

As regards nitre cake: In the London area to-day, and for several years now, there has not been any difficulty in disposing of this product at 22s. 6d. per ton.

The interest and maintenance charge, taken as it is by your contributor at 15 per cent. on capital cost, is reasonable.

As regards the capital cost of a nitre potting oven and the charges in the shape of renewals for pots, etc., with an efficient arrangement, this cost need not exceed 2·5d. per ton of monohydrated sulphuric acid produced.

Having regard to the foregoing observations, the financial statement, on page 827 (*ante*), needs to be revised as follows:—

	£ s. d.		£ s. d.
Gain on materials ..	2 12 0	*Charges*—	
		Increased capital charges	0 11 6
		Power, steam and platinum	0 6 6
		25½ cwt. of nitre cake at 22s. 6d.	1 8 8
		Balance in favour of ammonia oxidation	0 5 4
	£2 12 0		£2 12 0

In the writer's view, the assumption that "for all practical purposes the works costs can be compared on the basis of materials" is untenable.

Personal and Other Factors

The considerations raised in this connection are as follows:—

(*a*) Convenience and cleanliness.

(*b*) Substitution of a simple, understandable process for one involving chemical and technical control and supervision.

And (*c*) relative flexibility.

As regards (*a*): There is no reason why the operation of potting should not be convenient, and the potting oven and its precincts perfectly clean. Everything depends on design, and the various facilities afforded. In too many cases the pots are placed in an intense heat zone with the whole of the burner gases circulating around them. Under such conditions, violent priming takes place immediately the nitrate of soda and sulphuric acid are potted, and the risk of fracture of the pots is accentuated. Nothing is so disastrous to the brickwork of the potting oven, as indeed to the adjacent brickwork, as the action of hot fluid nitre cake, which ensues during the time a fractured pot is being operated. But it is known that a potting oven can be so designed, and the special trays (which are preferable to pots) so disposed as to ensure complete immunity from breakage. A special tray suitably disposed will serve from eighteen months to two years without needing renewal.

Concerning the second consideration (*b*): In the writer's view, the two processes are not comparable. At all events, they are sufficiently diverse to necessitate in the one case an ordinary process worker—a burner-man, and in the other case a skilled technician is required. Obviously, if one expects an ordinary worker to perform the duties of the skilled technician, the results are bound to be unsatisfactory.

The third consideration is the one of flexibility. No one conversant with the practical working of a sulphuric acid plant will deny that a potting oven affords adequate flexibility. Double the normal duty can be readily obtained without any apparent inconvenience or inefficiency.

In the case of an ammonia oxidation plant, it is doubtful whether the platinum gauze of the converter can meet an extra load of 100 per cent., and still give the same efficiency. Equally, the ammonia vaporiser cannot be expected to be so elastic as to deal with double the quantity of liquor ammonia and to ensure a waste liquor free of ammonia. It is not doubted that an ammonia oxidation plant can be made flexible, if flexibility is contemplated when the plant is originally designed. But, obviously, to afford flexibility, extra capital outlay will be entailed.

In this connection it is important to remember that no properly operated and supervised sulphuric acid plant, except those working on an intensive system, should need, even for temporary periods, a double replenishment of oxides of nitrogen. The question of flexibility, therefore, should only concern a relatively small number of works.

Stability and Operation of the Plant

Your contributor gives sound practical advice under this heading, and very little comment is called for. It has been found in practice that if the converter is placed at an appreciable distance from the still, or dephlegmator head, it is advisable to run the connections in lead pipe, as corrosion of wrought-iron and cast-iron pipes undoubtedly arises. Platinum can be economised by the use of gauze of finer mesh, two such gauzes answering satisfactorily in lieu of four having the coarser mesh hitherto largely used. Experience suggests that it is advisable to accumulate an extra stock of nitrous acid prior to the introduction of a new gauze, as if the latter proves intractable for a time, no irregularity of the operation of the sulphuric acid plant will occur in view of the reserve available. Contingencies such as the one in question have to be legislated for, but no insuperable difficulty need arise. An important point is to keep the catalyst free from dust and rust. This desideratum can be partially ensured in the way already indicated. It is believed that more gauzes have been rendered permanently *hors de combat* through rust than through poisoning by inhibiting agents.

A Few Generalisations

No amount of argument will convince the practitioner that an ammonia oxidation plant possesses the same simplicity and affords the same ready response as the nitre potting operation. These two operations must be placed in entirely different categories. Even the strongest claim urged by your contributor, namely, the continuity of feed of nitrous gases loses cogency when it is examined in detail. The efficient operation of the Glover and Gay Lussac towers is a much more vital factor in ensuring continuity of conditions in the working of a sulphuric acid plant than the operation of an ammonia oxidation or other equivalent plant. The function of the nitre potting operation or an ammonia oxidation plant is to replenish the supply of oxides of nitrogen, which are lost, chemically and mechanically, in the process. The less the loss the smaller is the service which the plants under review are called upon to discharge. With an efficient sulphuric acid plant and a

constant sulphur content in the material being combusted, the loss should not exceed 2 per cent. of the sulphur equivalent of the acid produced. The potent factor in attaining uniformity and continuity of conditions is to ensure that the quantity of nitrate of soda in circulation in relation to the sulphur under combustion approaches the ratio of 18 to 100. Under such conditions, given efficient working of the Glover and Gay Lussac towers, it will be found that the ratio of the nitrate of soda potted, or the oxides of nitrogen derived via the ammonia oxidation plant, only represents about 11 per cent. of the total oxides of nitrogen in circulation. Hence continuity of feed obtains so far as 89 per cent. of the total oxides of nitrogen is concerned, with intermittent potting. That the latter operation does not seriously disturb the conditions is shown by reference to the continuous recording chart on page 115, which gives the temperature of the gases entering the first chamber of a set, where nitre potting takes place once each hour. It will be seen that a slight increase of temperature occurs almost coincident with the potting operation, and thereafter the temperature recedes until the time is approached for the next "potting."

The chart is typical of hundreds which have been taken under similar conditions, and affords a measure of the conditions obtaining in a unit of acid plant where nitre potting is still the vogue.

No adept works manager resorts to nitric acid for ensuring instant flexibility of a plant, in actual operation, which has become slightly disorganised. He invariably carries a sufficient stock of strong nitrous acid as the safety medium against such a contingency. A slight extra feed for a period of an hour or so works wonders, and soon restores normal conditions.

Direct Use of Nitric Acid

It is not conceded that nitric acid is the cheapest means of supplying oxides of nitrogen to a chamber plant. How can this be so when plant has to be provided, when fuel is necessary, and when additional labour is involved? The potting of nitrate of soda and sulphuric acid does not necessitate extra labour, fuel, or anything approaching the plant which a nitric acid installation entails. Even assuming a nitric acid plant exists at the works where sulphuric acid is made, the argument would appear untenable. Equally, your contributor's anticipations concerning the eventual availability of materials is somewhat deluding. Chilean deposits are by no means exhausted. Norwegian synthetic nitrates have come to stay, and will be increasingly felt. When the Haber and Claude plants are ready to place their products on the market it will be found that the laws of supply and demand will impose a limit to the production of ammoniacal nitrogen; the extent to which these products will be manufactured will be limited by market considerations, and it will be found that firms operating the latter processes will turn their attention to the Ostwald process for the conversion of ammonia to nitric acid, and its subsequent manufacture into nitrates. The expensive and costly tower absorption system, such as is used at the Höchst Farbwerke for the recovery of the oxides of nitrogen, will sooner or later be supplanted by the compression system, concerning which considerable work was done by the French Government during the war, and of which some details have been vouchsafed by M. Max Kaltenbach in the French technical journals. It is not improbable that the ratios of quantities and prices which hitherto obtained between ammoniacal nitrogen and nitrate of soda will be maintained after the inception of the Haber and Claude processes on the large scale, and that intensive cultivation in the United Kingdom, the colonies, and dependencies will absorb the extra production of both products.

Whilst your contributor's article is excellent in many respects, it is feared that several of his deductions are unsupportable, and some of his indications are misleading. Without doubt the chamber process has yet a considerable lease of life, but it cannot be conceded that the installation of an ammonia oxidation plant will contribute in any material degree to the promotion of its longevity. It is not believed that the death knell of the nitr. pot has yet been tolled.

British Engineering Standards

Association's Fourth Annual Meeting

THE British Engineering Standards Association held its fourth annual general meeting on Thursday, July 13, at the Institution of Civil Engineers, when the chairman, Sir Archibald Denny, presented his annual report and made a review of the position. The meeting was well attended and the Chairman's report again showed great expansion in the work.

There are now nearly 2,000 engineers who give their time and experience to this National Institution. Last year just under £17,000 was expended, towards which industry, in spite of the depression in trade, contributed £9,300, the remainder coming from the Government, the India Office, and the Governments of the Dominions overseas. The Chairman thanked all those firms who, in spite of the grave difficulties with which they had one and all been faced, have so liberally supported the Association, at the same time he felt that the Association should not have to live quite so much from hand to mouth and should be able to build up a small reserve, and this could be accomplished without difficulty if industry would still further increase its subscriptions and the many firms who so far did not financially assist would agree to become annual subscribers.

He then passed in review the progress of the work in the various sections, dealing briefly with the shipbuilding, automobile, electrical and other work, especially that in connection with the Government Interdepartmental Committee.

The Association has issued 72 new and revised specifications during the year and the sales of the publications have reached 39,000, in addition to a very large number of Aircraft specifications distributed on behalf of the Air Ministry. A certain number of constructive suggestions were made by those present which will in due course be considered by the Main Committee.

Institution of Chemical Engineers

IN addition to the usual particulars regarding name, age, and occupation, the application form for membership and associate-membership of the Institution of Chemical Engineers requires the following information from applicants:—References as to (*a*) scientific attainment; (*b*) responsibility and occupation; (*c*) personal integrity; general education (with dates); scientific education (with dates and special reference to the subjects of chemistry, physics, mathematics, mechanics and engineering); practical training (with dates and particulars); scholarships, degrees and diplomas; subsequent career (positions held, with dates, and responsibilities); present occupation (commencing date and particulars); degree of responsibility involved in present occupation; and a brief account of any chemical engineering work done, for which the candidate was mainly responsible, research accomplished, papers published, books written and published, etc. Publications should be submitted on request if available. The following additional information may be supplied at the option of the applicant:—Technical association with business firms; directorships, retainers, consultantships, etc., and membership of other institutions. As previously announced, copies of the application form may be obtained from the Hon. Secretary, Institution of Chemical Engineers, 166, Piccadilly, London.

American Manufacture of Synthetic Ammonia

DR. W. H. NICHOLS announced at the annual meeting of the Allied Dye and Chemical Corporation of America that the company was now successfully manufacturing ammonia from atmospheric nitrogen on an industrial scale. The plant was the first of its kind to be operated successfully in the United States, and had been working at capacity since its completion last autumn.

Association of British Chemical Manufacturers

Review of Current Problems and Developments

THE sixth annual general meeting of the Association of British Chemical Manufacturers was held at the Chemical Society's Rooms, Burlington House, London, on Thursday, July 13. Sir John Brunner, Chairman of the Association, presided.

The Chairman's Address

In moving the adoption of the report, the CHAIRMAN said that with regard to the staff the Association was to be highly congratulated upon the fact that they had secured the services of Mr. Woolcock upon mutually satisfactory terms for a further period of five years. (Cheers.) Mr. Woolcock was to a very large extent the Association. They could not, he thought, do without him at the present, and he was very pleased to know that they would be associated with him in the future.

The Question of Tariffs

Dealing with the question of tariffs, he said: There is, of course, acute difference of opinion in this country whether a tariff is good for our own country or not. I think we are all agreed that a tariff in a foreign country is not a good policy, and, unfortunately, since the war all the countries of Europe have set up almost prohibitive tariffs, which have done a great deal of mischief in retarding the revival of trade. With regard to the American tariff, a new proposal was brought before the Senate, not only with regard to tariffs, but with regard to subsidising the American shipping industry, and I am very pleased to see in the Press that they have found very great difficulty in carrying this almost prohibitive Fordney Bill, and that apparently the whole matter is again going to be dropped, as it was last year. We will, I am sure, keep our eyes upon this matter, and if anything can be done by the Council to mitigate the operation of the American tariff, I am certain the Association will do it.

Standardisation of Plant

So far as chemical plant is concerned, it is, of course, very difficult to standardise most of the plant used by chemical manufacturers. Every operation, practically speaking, requires its own special plant to carry it out; but wherever things can be standardised we shall, as a body, very heartily welcome such standardisation, because our plant will thereby be made cheaper. You know that jacketed pans have already been done; the standardisation of cast-iron filter presses is on the way, and the final report will be considered by the committee on Wednesday next.

Transport

I now want to refer to transport matters, and here I want to say how greatly we feel indebted to Mr. Malacrida and the department over which he presides. (Hear, hear.) You will have seen in the papers this morning what has happened with regard to the railway rates of the country. Shortly, the rates are reduced to 75 per cent. above pre-war figures instead of 100 per cent., and the flat-rate increases are to be reduced from 1s. to 6d.; from 9d. to 4d. and from 6d. to 4d. per ton, the flat rate of 3d. being unaffected. The rate for small parcels is to be reduced from 150 per cent. to 100 per cent. above pre-war.

I would like to bring to your notice a little paragraph in the report which says: "The constant bringing together of industrialists and railway officials has created a new atmosphere, and the relations between them are now on a very satisfactory footing," which is, I think, a great deal more than can be said of the relations of traders and railway companies in the past. It says a great deal for the tact of our officials who have been able to create this friendly feeling with the railway companies. It not only saves traders a great deal of expense, but also the railway companies; and if both sides get what they want without expense, it always tends to the reduction of rates.

Home Office Regulations

With regard to the Home Office Regulations under the heading "Dangerous and Unhealthy Industries"—a term which I personally object to, because there are a great many chemical operations which are no more dangerous to health or to life than working in a cotton factory or even sitting at a desk in the Home Office—I think it is begging the question to call the whole of the chemical industry a dangerous and unhealthy industry. (Hear, hear.) It is one of the difficulties under which legislation of the present day labours that Parliament is so overwhelmed with work that you have to leave regulations of this character to the various departments. However, we have succeeded in this instance, at any rate, in arriving at an agreement with the Home Office which, although it is not entirely satisfactory to us, is one which we can acquiesce in. I remember, some ten years ago, the Home Office issued regulations with regard to railway lines in factories. They issued them straight out as draft regulations, and an inquiry had to be held. The inquiry which took place at that time cannot have cost less than £50,000, seeing the number of counsel and solicitors who were engaged in it. We have got this alteration of regulations through this time, practically speaking, without any expense to the chemical industry of the country. (Cheers.)

I think you can be very highly congratulated upon the continued usefulness of this Association to the trade of chemical manufacturers in this country, and so long as we go on in the Council, as we have done in the past year, in entire harmony, that state of things will continue. I think that we have in founding this Association done a great stroke of work for the chemical industry, and I trust it will be in the future as prosperous as it has been in the past.

The motion for the adoption of the report was seconded by Mr. Max Muspratt (Vice-Chairman).

Dr. Armstrong on Tariffs and Licences

In the subsequent discussion Dr. E. F. ARMSTRONG said that the question of tariffs and licences and the whole mechanism of safeguarding industries was one of extreme complexity which, unfortunately, brought in politics. Those who believed that any other policy than that of Free Trade led to destruction had been able in the case of the chemical industries to sacrifice that view for the greater end, which he defined as the establishment of chemical industries in this country. The heavy chemical industry had, fortunately, perhaps partly for geographical reasons, been able to stand on its own. The dyestuff and fine chemical industries had found themselves in a more difficult position. To have an industry of that type they must have trained technical men to carry out the work. The most brilliant finance, the most original and remarkable organisation, even cheap transport—all these were unavailing if they had not the technical ability to make these products, because they were the most complex manufactured products of all. He felt sure there was in this country sufficient technical ability and sufficient aptitude for chemical processes to work out and put any process of whatever kind into action. (Hear, hear.) The chemical industries were of national importance, not only for the products they gave, which surely should be made in this country rather than be bought from abroad, but as training grounds for chemists, the chemist being regarded as a very important servant of the State. If they looked round the technical men holding more or less responsible positions throughout British industry, ignoring those who were connected with the heavy chemical industries, they would find that a great many came out of one or two industrial schools, possibly out of the laboratories of a firm like Nobels. That showed that in order to have highly trained industrial chemists they must have the industrial school in which to train them. Unless we established a fine chemical industry and a dye industry in this country, we should not have industrial schools in which to train those chemists who would be at hand in our hour of need, whether in peace or in war.

Mr. E. V. Evans Favours More Protection

Mr. E. V. EVANS, in commenting on that portion of the report which dealt with the Dyestuffs Act, said he thought they must face the fact to-day that the Act did not afford the measure of protection that the industry really required. The Act was formulated to promote the dye industry without prejudice to the textile industry, a matter which Euclid would have shown by one of his propositions to be entirely absurd.

They would remember that in order to assure that the interests of the textile industry should not be adversely influenced during the growth of the British dye industry, the Act provided that the representatives of the users should be in the majority on the Licensing Committee. The users had not taken undue advantage of their superiority in number, but the fact was that they possessed this potentiality. Were it not for the fact that they were men honestly desiring the dye industry to be harboured in this country, the position would be an impossible one.

The question of price was, at the moment, an acute one. If a consumer of dyes could show that he had to pay more than three times the amount for his British dye than he paid for his foreign dye before the war, then that was sufficient justification for the importation of the foreign dyestuffs, provided, of course, that that foreign dyestuff was itself sold at a figure which was not more than three times the pre-war foreign price. This factor of three was an exceedingly serious matter to the dye industry at the present moment. He could well understand that some simple colours could be made at this price, but he was very certain that the whole dye business could not be worked on that basis, and it was even more impossible to imagine that new ventures could be undertaken with this price factor in operation. It would be a totally different thing if the sales of the dye industry and the output of plant were normal. They had been forced to the conclusion that the best way to resuscitate business in this country was that they should temporarily labour under this disability of the price factor, and although their representatives had fought strenuously against the acceptance of the factor, they had been literally forced to accept it at the present moment.

Engineers for Chemical Works

Dr. SELIGMAN referred to the work of the Joint Research Committee of the Association and the British Chemical Plant Manufacturers' Association, of which he is chairman. There had been, he said, a tendency in the past to standardise everything irrespective of whether it was amenable to standardisation or not, and the committee had put the brake on where it was felt to be desirable, and had probably contributed to more practical results in that way. As far as standardisation was concerned in chemical industry, the committee thought it could do practically everything that was wanted, and the two small subjects which it had taken in hand had been dealt with so thoroughly by the sub-committees to whom they were entrusted that they had justified that view to a large extent.

The joint committee had before it a suggestion that it should undertake an investigation into the education of engineers for chemical works. There was a good deal of hesitation on the part of many members of the committee in accepting this task. There was not unanimity amongst the members on the subject, and he thought if it were possible for some of the leading members of the Association to express their views whether it was desirable that the committee should deal with this subject, it would be a great help in reaching a decision. The whole question bristled with knotty points, and many were frankly afraid of it. Members of both the committee and the sub-committees which it had formed had worked extremely hard, but he felt that they wanted a little more inspiration than they were getting. If only the members of the Association could give them more problems to tackle, more things which they could look into in a preliminary way, he would feel happy in the future utility of the joint committee.

Popular Ignorance of Chemical Industry

Sir WILLIAM PEARCE, M.P., said he was afraid that neither the nation nor the House of Commons realised the enormous importance of synthetic organic chemistry and the great future before it in dyes and fine chemicals. He supposed they would be suspect if they went in for propaganda, but outside and inside the House of Commons the importance of these two branches of their industry was really not properly recognised, and it was a question of education.

Dealing with the dyestuff and fine chemical industries, he said: I believe these two industries will be the two great industrial successes of the future, and no nation can afford to do without them. If you once get that into the minds of the public and of the members of the House of Commons, I think those two industries may be secured. The Germans take that view. I had a remarkable interview with one of the directors of the German I.G. about two years ago, and he told me that the German Government and people look upon synthetic organic chemistry as the best asset they possess, the best hope they have of recovering commercial prosperity or even supremacy. That is not realised in this country. It would be a good thing if your Council could put the facts of the progress of these various industries before the public. I know it would be welcomed by members of the House of Commons, very few of whom really understand the great importance of these two industries. They complain to me of lack of information; they do not know the progress of the industry or understand its difficulties. These difficulties are stupendous to-day, because not only have they the enormous combination of the German I.G. to contend against, in which the whole of the industry is one combination and acts with a general staff, and is altogether a power which it would test anybody to compete against; not only have we to compete against that sort of position, but these two industries—and I do not belong to them myself—have at the same time to meet an unexampled slump in the textile trade, from which it is only just recovering. I do not think the public thoroughly or properly appreciate either the difficulty or the position, or its enormous importance.

I have just suggested that we as the body representing the chemical industry in this country might do well to have some serious combination to work and get the public really to recognise the difficulties and the importance of those two or three great branches of the industry in which we are all engaged.

Educating the Public and the Trade

The Rt. Hon. J. W. WILSON, M.P., on this point said he thought that one of the most important pieces of work during the year was what was done with regard to the British Industries Fair, and the small exhibition organised in Tothill Street for the education of Members of Parliament. He thoroughly agreed that they had a good deal to learn from Germany both on the lines of unity of interest in different chemical manufactures and also of education of the public and indirectly of the buyers. He was satisfied from what he saw of the British Industries Fair that that did a great deal of good in two directions. One was in educating the public; but there was another side to that exhibition which was also valuable, and that was in bringing the different members and staffs of the various chemical firms and manufacturers together for a week—(hear, hear)—to compare notes and to realise that there was much more to be gained by conference and by interchange of views than by following the traditional British attitude of looking suspect on everybody who asked one a question. He thought there was a great deal more to be done by cultivating friendly relations between buyer and seller and getting them interested in the matter than in artificial or temporary barriers and hindrances. They had to take the public more into sympathy and into a knowledge of the general position.

The CHAIRMAN having replied to one or two points raised in the discussion, the report was unanimously adopted.

Messrs. Feasey and Co. were unanimously reappointed auditors for the ensuing year.

Members' Subscription Reduced

At a subsequent special general meeting of the Association the Chairman moved:—"That the amount of the annual subscription payable by members of the Association be diminished by 20 per cent. for the year 1922-23."

Sir WILLIAM PEARCE, M.P., seconded the motion, which was carried unanimously.

Mr. MAX MUSPRATT, in proposing a vote of thanks to Sir John Brunner for his conduct as chairman of the Association for the past two years, said that in the whole history of the chemical industry in this country there had not been two more important or more difficult years, and Sir John Brunner with his large experience and his tactful manner, his power of expressing his opinion, at the same time not forcing it upon the Council, in some of the very controversial matters they had had to deal with, had been a most excellent chairman, and they were fortunate in having had him during the past two years.

Sir WILLIAM PEARCE, in seconding the motion, said he was sure that Sir John had made many friends during his tenure of office and had done their work exceedingly well. They were all grateful to him for his services.

The motion was carried amid applause, and the Chairman briefly returned thanks.

The Protection of Metals from Heat Oxidisation

By F. S. Lovick Johnson, A.M.I. Mech. E.

The process described in the following article is controlled in this country by the Scarab Oil Burning Co., Ltd., London, who have recently completed the erection of a new Calorising plant.

The present high cost of labour and material for replacements and maintenance renders particularly interesting any method whereby these charges may be lessened. In this connection the problem of the oxidisation of metal parts when subjected to the action of intense heat is of great importance; generally speaking, there is hardly an industrial plant in the country which is not experiencing some oxidisation problem from high temperature, and the loss accruing from labour, material, time and lay-up of equipment is enormous.

The destructive action of heat is, of course, no new problem, but one which has confronted those engaged in the mechanical arts ever since the beginning of the iron and steel age, and for

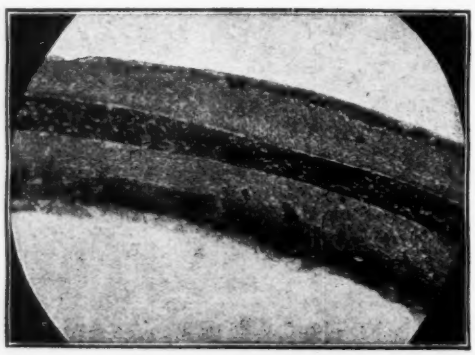


FIG. 1

many years past scientific research and inventive ingenuity have exerted themselves to provide a remedy. Although from time to time various processes have been introduced for protecting metals against oxidisation and the corrosion due to acids and the atmosphere, there is only one process in existence which is primarily intended to give protection against oxidisation at high temperatures. This recently developed process is known as calorising, which is the only successful and economical process for rendering metals highly resistant to the ravages of high temperature.

The Calorising Process

The process of calorising was discovered by T. Van Aller, in 1911, and developed by the General Electric Company of Schenectady, U.S.A., and although it has only been applied commercially to any extent during the past three years, it has proved its value in America and is now attracting considerable attention in this country.

Broadly, the process of calorising consists in the formation of a surface alloy of aluminium on ferrous and non-ferrous metals, and is achieved by placing the articles to be treated in an air-tight retort, partly filled with the calorising mixture (which consists of finely divided metallic aluminium suspended in aluminium oxide), and subjecting it to a high temperature for several hours. During the process, a continuous current of hydrogen is passed through the retort to ensure an inert atmosphere. Before being placed in the retort the articles are required to be thoroughly cleaned and to have a surface free from grease, scale and other foreign matter, this being effected either by sand-blasting or pickling. The treatment, conducted at high temperature, so thoroughly infuses aluminium into the exposed portions of the metal being treated as to form a homogeneous alloy for a certain depth. This depth ranges from a few thousandths of an inch to the permeation of the entire mass and is governed by varying the duration of the treatment and the composition of the mixture. It is thus apparent that the essential difference between calorising and processes hitherto used commercially is that the protective surface is not imposed as a coating or skin upon the metal to be treated, but, on the contrary, enters into intimate association with it, forming a solid solution alloy. It must not be confused with any coating process like galvanising, sherardising, coslettising, or oxide coatings. It is, moreover, distinct from the numerous homogeneous alloys, some of which, containing nickel or chromium, are highly resistant to oxidisation at high temperatures. Calorising differs from such alloys in that it consists of using a relatively inexpensive metal, such as iron or steel, in itself readily oxidisable but covered with a continuous protective alloy coating which becomes a homogeneous part of the metal treated and which is effected at a comparatively low cost.

It is interesting to note the effect of calorising on a cross section of metal as revealed by a micro-photograph, and Fig. 1 clearly shows the diffusion of the aluminium into the base metal. The extreme outer portion is aluminium; under this is a wide band of ferro-aluminium; in the centre the steel remains unchanged except that it is thoroughly annealed. The calorised coating consists of a comparatively thin alloy layer, which is very rich in aluminium, but on being subjected to high temperature under working conditions this alloy layer penetrates or diffuses further into the metal, forming a larger amount of homogeneous ferro-aluminium alloy, and an outer coating of aluminium oxide, which is the protective surface. It is thus apparent that, should the outer surface become injured, the protective surface will renew itself by the oxidisation of the alloy exposed.

Limits of Temperature

The limiting temperature at which calorised articles will withstand oxidisation is governed by the nature of the alloy formed and the service to which it is subjected. Generally speaking this limit varies from 900° C. to 1,000° C. Above 1,000° C. the diffusion of aluminium is so rapid that the alloy quickly becomes too weak in aluminium to form a satisfactory protective oxide, with the result that the underlying metal will commence to scale.

FIG. 2

Regarding the physical properties of calorised metal it has been found that the process anneals the material, giving results which are favourably comparable with those obtained by a

soft annealed finish. From the various investigations carried out it has been proved that any change in the physical characterisitcs of the average application does not require serious consideration; the properties of strength, electrical and thermal conductivity varying with the cross section affected by diffusion and generally speaking the thermal and electrical conductivity are somewhat lowered by the process. Samples submitted to crushing, flanging, expanding and pulling tests have demonstrated that calorised material is capable of withstanding all ordinary handling without destruction of the alloy, while microscopic examination has revealed the quality of homogeneity.

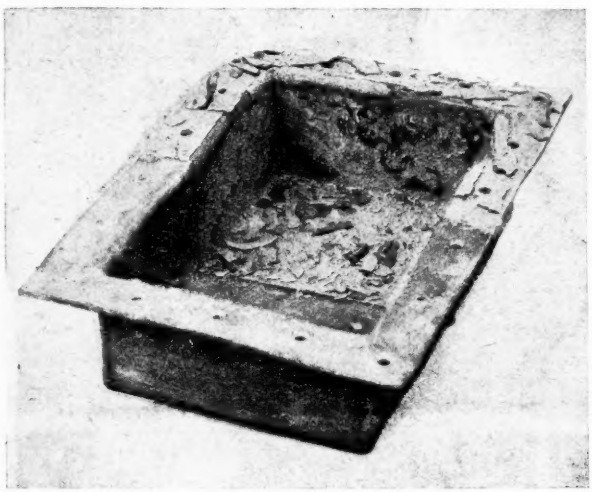


FIG. 3

It should, however, be understood from the nature of the hard and somewhat brittle protective coating that calorised metal cannot be bent or hammered cold, but at a bright red heat it may be bent without affecting its resistance to oxidisation. The principal machining operations should therefore be carried out on the articles before being calorised, although calorised boiler tubes can be satisfactorily expanded cold without detriment if they are made of seamless steel. The dimensions and weight of the metal treated are only very slightly increased by calorising, the increase in dimensions being not more than a few thousandths of an inch. Calorisation increases the life of metal articles from ten to thirty times, according to the material and conditions of temperature to which they are subjected, the protection afforded depending considerably upon the proportion of the cross section affected by the alloying and the percentage of the aluminium content.

Application to Various Metals

Various metals may be calorised—cast iron, wrought iron, malleable iron, steel, nickel, nickel steel, copper and brass, and in all instances where metals suffer from the ravages of heat oxidisation, the wasting effect of some forms of corrosion or the deleterious effect of certain gases, calorising can be used with advantage. The results obtained with certain metals are better than with others; for instance, greater protection will be afforded to mild steel articles, particularly those which have been mechanically treated by processes such as rolling, spinning, etc., than ordinary castings. Good results have been obtained from castings of pure ingot cast iron carefully made and of small parts, but low grade ferrous castings invariably contain slag, sand-inclusion, blow-holes and other imperfections which break up the continuity of the surface and prevent homogeneity in the alloyed surface. The amount of free carbon present also appears to exert a deterrent influence on the depth of penetration of the protective medium. Again, the characteristic "growth" of cast iron on repeated heating and cooling tends to crack up the surface layer of oxide with the result that in a short time the aluminium content will become too weak to form an efficient oxide coating and breakdown will occur. Wrought iron is likewise a very variable material in the matter of quality, and with poor grades of wrought iron containing mixtures of genuine wrought iron and steel scrap, large percentages of slag and phosphorus, it is impossible to guarantee good uniform results. Excellent results, however, have been obtained with good grades of steel castings, good quality wrought iron, mild steel, etc.

Acid-Resisting Qualities

Calorising is primarily a protection against burning or scaling at high temperatures, but there are numerous instances where it is most effectively employed to meet conditions other than the primary one for which it was intended. Calorised non-ferrous metals, such as copper, brass and nickel, are excellent non-corrosive elements resistant to atmospheric conditions and certain aciduous liquids. Calorised ferrous metals are likewise strongly resistant to the effect of carbolic acid, hot tar, and pitch, and also to the wasting effect of sulphur dioxide and carbon monoxide gases as present in furnace gases.

As evidence of the performance of calorised metal under test conditions, the wrought-iron pipes, both cut from the same piece, shown in Fig. 2, were photographed. The longer pipe only was calorised and was afterwards heated to 985° C. in an electric furnace, open to the air and cooled, the operation being repeated several times. The total time during which the maximum temperature was maintained was about fifty hours. Thereafter it was heated to 885° C. and plunged into cold water after it had cooled to a dull red heat. This was repeated three times and the surface showed no signs of cracks or scaling. Finally this piece and the untreated piece were heated side by side with an ordinary blast lamp to a temperature of about 930° C. for four hours, then cooled and the heat once more applied for a period of four hours. At the end of this test the untreated pipe was badly burned and its thickness had been reduced by one half at the point of application of the flame. The contrast between this pipe and the calorised piece was very marked; the latter appeared to be unchanged.

Two further samples illustrating the comparison are shown in Figs. 3 and 4. In Fig. 3 an annealing box is shown. This box was cut in halves, one half was calorised and the other untreated. Both halves were then welded together, and the box as a whole was subjected to a temperature of 820° C. for a period of 30 hours, with the result as shown. In Fig. 4 a sheet iron annealing box is shown, and from the cover a small rectangular piece was first removed and calorised. This portion was then welded into the cover again, and the whole tested in an annealing oven for two periods of five hours each at 820° C.

Industrial Applications

In the various industries there are many applications where the marked superiority of calorised metal for unusual

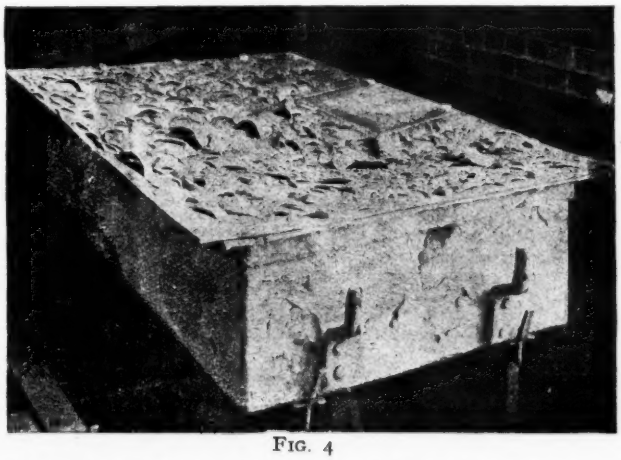


FIG. 4

heat conditions has consistently yielded good results, of which the follqwing may be cited:—Pyrometer protection tubes; carbonising and annealing boxes; metal furnace linings; baffles, etc.; lead pots; oil cracking pipes; superheater tubes; locomotive firebox stay nuts; marine boiler furnace stay nuts; air preheating tubes; fire bars; parts of continuous "operation" furnaces, such as link chains, saddles, buckets, muffle rolls, etc.;

parts of tunnel kilns; thermostat fire ends; producer gas filter chambers; pottery racks; molten sulphur containers; soldering irons; carbolic acid lines; copper controller contacts; copper condenser tubes; valves for hot gases; valves and piston heads for Diesel engines; parts of glass manufacturing equipment, such as gatherers, mantle rods, etc.; soot blower equipment; retorts; hot bulbs for oil engines.

There are, however, many possible applications which have not been treated, and which will suggest themselves to the engineer, metallurgist and works manager, in connection with the equipment used in their individual process of manufacture.

With reference to the cost of the process, this is not excessive, having regard to the saving effected, both in the labour and material involved in renewals. It is claimed that the cost of calorising a given article is in many instances actually less than the cost of a similar untreated replacement, a fact which makes it an attractive proposition from an industrial point of view.

Australian Trade Conditions

A Brighter Outlook

In an interview with a Press representative, Mr. W. L. Baillieu, one of the leaders of finance and commerce in Australia, now on a visit to this country, took an optimistic view of the present position and prospects of Australia. Mr. Baillieu is a director of many well-known companies, among which are the Electrolytic Zinc Co., of Australasia, Broken Hill Associated Smelters, Zinc Producers' Association, Copper Producers' Association, North Broken Hill, Amalgamated Zinc (de Bavay's), Minerals Separation, Electrolytic Smelting and Refining Co., Metal Manufacturers and Australian Fertilisers. Mr. Baillieu has taken a prominent part in the development of the mining and metallurgical industries of Australia, and his views on these branches of activity are worthy of the deepest consideration, particularly as it is estimated that approximately 50 per cent. of the capital invested comes from our country.

Commenting on the setback of early 1921, Mr. Baillieu says that, although this was short, it was very severe, but the outlook in all branches of trade—export, import, and manufacturing—is now bright.

Although badly racked by labour troubles during the past three years, Broken Hill, in the opinion of Mr. Baillieu, has seen the passing of this phase, and a period of industrial peace and prosperity is looked forward to.

As far as the copper mining industry is concerned, Mr. Baillieu admitted that it had had a particularly lean time, and was not yet out of the wood. He was enthusiastic over the prospects of New Guinea copper mines, as they have a fine supply of native labour, are well situated geographically, have all their capital provided, are connected by rail with a fine port, have great water power at hand, and have mines in which big deposits of relatively rich ore are exposed.

Mr. Baillieu regards the Electrolytic Zinc Co. of Australasia as the greatest metallurgical success of Australia. With an output of 25,000 tons of high-grade zinc per annum, and only half the plant in operation, the company has commenced paying dividends, and when the full zinc plant is at work, in six months time, he estimates that it will produce 45,000 tons of zinc, 6,000 tons of lead, 1,200,000 oz. of silver, 10,000 oz. of gold, 200 tons of cadmium, and large quantities of oxide, lithopone, leaded zinc, etc., each year.

Affairs of a Manufacturing Chemist

A receiving order against Mr. Frederick Ayland, 223, St. Margaret's Road, Twickenham, Middlesex, was made on June 12, on the debtor's own petition. The statement of affairs shows liabilities of £2,365, while the assets are estimated to realise £883, from which preferential claims of £21 have to be deducted, leaving net assets of £862, or a deficiency of £1,504. The debtor attributes his failure to insufficient income to meet living expenses, interest on borrowed money and depreciation in the value of shares. It appears that the debtor and a partner formed a limited company for the purpose of acquiring the business of a manufacturing chemist. The company traded as paint manufacturers and structural erectors: 500 ordinary shares were allotted to him in consideration of his business experience. He invested no cash capital in the company himself, but his wife subscribed for 1,000 £1 preference shares. In 1920 the company made certain advances to him in respect of which £250 is still owing.

Testing of Dyes and Fabrics

New Laboratories at Manchester

In connection with the completion of the new premises for the Manchester Chamber of Commerce Testing House, which was established in 1895, *The Monthly Record* of the Chamber states that the work undertaken in the Chemical Department of the Testing House is of a varied character.

Thus, dyed yarns and fabrics are tested for fastness of dye, and the nature of dyestuff: qualitative and quantitative determinations of sizing ingredients in cloth are carried out, as well as the identification of different fibres: whilst the investigation of defects, such as stains, tendering, or other forms of damage to yarn and cloth, forms an important section of the work. In addition to the foregoing, a miscellaneous variety of products used in industry are analysed or otherwise examined. These include water, coal, petrol, benzol, oil and fat, creosote, tar, bitumen, asphalt, limestone, cement, type metal, brass, lead, alloys, ores, soap, glycerin, adhesives, salt cake, polish, paper, varnish, boiler fluid, fire extinguisher, butter, margarine, milk, chocolate, toffee.

Tests of Wood Pulp

The Testing House is authorised by the British Wood Pulp Association to make official tests of wood pulp for the determination of the moisture content, and members of the staff pay frequent visits to paper mills in different parts of Great Britain and Ireland for the purpose of drawing samples for testing. In such cases, the "correct condition weight," as calculated from the test result, is declared by the Testing House, and constitutes the invoice weight of the consignment.

The new premises have been specially planned to suit the particular requirements of the work, and opportunity has been taken of introducing many conveniences which have not been hitherto available.

Particular attention has been paid to the lighting of the laboratories, which is generally effected by large windows having a northerly aspect. Electric power is employed for driving testing machines and other apparatus, nine electric motors being employed for this purpose. A "Carrier" system humidifier is installed for the automatic control of the atmospheric moisture in the Cloth and Yarn Testing Laboratories. This constitutes a specially noteworthy feature of the Testing House equipment, since it permits of physical tests being carried out under uniform atmospheric conditions. The very marked influence of atmospheric moisture on certain of the properties of yarns and fabrics renders such a provision essential if results obtained at different times are to be strictly comparable; or, in short, if they are to be reliable. For the purpose of taking humidity readings, in preference to the ordinary wet and dry bulb thermometer, or the sling hygrometer, the "Assmann" type of hygrometer is used. With this instrument, the air is conducted to the thermometer bulbs by means of a fan directly coupled to an electric motor working at a speed of 4,500 revolutions per minute.

Developments in Use of Nickel

Speaking on Wednesday at the annual meeting of the Mond Nickel Co., Ltd., held at 39, Victoria Street, London, the Chairman (Mr. Robert Mond) said the present demand for metallic nickel was naturally far less than during the war. With a return, however, to stable conditions in the world, and a general trade revival, there was no reason why they should not expect renewed prosperity in the nickel industry. New uses for the metal were constantly being discovered. Some time must elapse until the consumption of metal for peace purposes reached a tonnage which would enable present producers to work their plants to normal capacity, and in the meantime the company would no doubt have to face hard competition. Thanks, however, to its unrivalled process and excellent organisation, the board had every confidence that they would continue to take the share of the trade which they claimed the company was entitled to in regard to its extensive mines and smelters and unique refining plant. With the view of extending the use of nickel, they had acquired the control of Henry Wiggin and Co., Ltd., in this country, and had recently participated in the formation of the American Nickel Corporation of Clearfield, Pa. The directors were convinced that it would prove a great advantage to the company.

Chemical Works Regulations

Revised Rules under the Factory Act

THE Home Office has just issued under section 79 of the Factory and Workshop Act, 1901, revised regulations to apply to the manufactures and processes incidental thereto carried on in chemical works. [H.M. Stationery Office, 4d. net.] The regulations approximate very closely to the new draft rules issued in January, 1921, and abstracted in THE CHEMICAL AGE (Vol. IV., p. 13).

The preamble states that regulations 2 (*b*) and 12, and, so far as concerns the processes of grinding or crushing caustic by machinery or packing ground caustic, making or packing of bleaching powder, distillation of gas or coal tar or any process in chemical manufacture in which gas or coal tar is used, the refining of crude shale oil and the manipulation of pitch, regulations 26, 27, and 28 shall not come into force till April 1, 1923, or such later date or dates as the Secretary of State may appoint, but save as aforesaid all the regulations shall take effect on October 1, 1922. From that date the regulations dated December 30, 1908, for the manufacture of nitro and amido derivatives of benzene, and the regulations dated August 9, 1913, for the manufacture of chromate and bichromate of potassium or sodium shall be revoked.

Part I. Provisions

The requirements of Part I., which applies to all chemical works, are substantially the same as the draft rules, but in rule 7, which refers to entry, except for rescue purposes, of absorbers, boilers, culverts, stills, tanks, etc., there is an added provision that a responsible person appointed by the occupier shall personally examine such place and shall certify in writing in a book to be kept for the purpose either that such place is isolated and sealed from every source of gas or fume and is free from danger, or that it is not so isolated and sealed and free from danger. No person, the regulation continues, shall enter any such place which is certified not to be so isolated and sealed and free from danger unless he is wearing a breathing apparatus, and (where there are no cross-stays or obstructions likely to cause entanglement) a life-belt, the free end of the rope attached to which shall be left with a man outside, whose sole duty shall be to keep watch and to draw out the wearer if he appears to be affected by gas or fume. The belt and rope shall be so adjusted and worn that the wearer can be drawn up head foremost through any manhole or opening.

The following rules are also of interest:

9. A sufficient supply of non-metallic spades, scrapers and pails shall be provided for the use of persons employed in cleaning out or removing the residues from any chamber, still, tank, or other vessel which has contained sulphuric or hydrochloric acid or other substance which may cause evolution of arseniuretted hydrogen.

10. (*b*) Except where the manipulation of strong acids and dangerous corrosive liquids is so carried on as to prevent risk of personal injury from splashing or otherwise, there shall be provided for those who have to manipulate such acids or liquids sufficient and suitable goggles and gloves or other suitable protection for the eyes and hands.

Rules of Employees

17. (1) Every person employed shall (*a*) report to his foreman any defect in any fencing, breathing apparatus, appliance, or other requisite provided in pursuance of these regulations, as soon as he becomes aware of such defect; (*b*) use the articles, appliances or accommodation required by these regulations for the purpose for which they are provided; (*c*) wear the breathing apparatus and life-belt where required under regulations 7 and 8. (2) No person shall (*a*) remove any fencing provided in pursuance of regulation 1 unless duly authorised; or (*b*) stand on the edge or on the side of any vessel to which regulation 1 applies; (*c*) pass or attempt to pass any barrier erected in pursuance of regulation 1 (*c*); (*d*) place across or inside any vessel to which regulation 1 applies any plank or gangway which does not comply with regulation 1 (*b*), or make use of any such plank or gangway while in such position; (*e*) take a naked light or any lamp or matches or any apparatus for producing a naked light or spark into, or smoke in, any part of the works where there is liability to explosion from inflammable gas, vapour or dust; (*f*) use a metal spade, scraper or pail when cleaning out or removing the residues from any chamber, still, tank, or other vessel which has contained sulphuric acid or hydrochloric acid or other substance which may cause evolution of arseniuretted hydrogen; (*g*) remove from a First Aid box or cupboard or from the Ambulance room any First Aid appliance or dressing except for the treatment of injuries in the works.

21. In a nitro or amido process: (*a*) If crystallised substances are broken or any liquor agitated by hand, means shall be taken to prevent, as far as practicable, the escape of dust or fume into the air of any place in which any person is employed. The handles of all implements used in the operations shall be cleansed daily. (*b*) Cartridges shall not be filled by hand except by means of a suitable scoop. (*c*) Every drying stove shall be efficiently ventilated to the outside air in such a manner that hot air from the stove shall not be drawn into any workroom. (*d*) No person shall enter a stove to remove the contents until a free current of air has been passed through it. (*e*) Every vessel containing nitro or amido derivatives of phenol or of benzene or its homologues shall, if steam is passed into or around it, or if the temperature of the contents be at or above the temperature of boiling water, be covered in such a way that steam or vapour shall be discharged into the open air at a height of not less than 25 ft. from the ground, or the working platform, and at a point where it cannot be blown back again into the workroom. (*f*) In every room in which dust is generated or fume is evolved an efficient exhaust draught shall be provided.

Grinding and Crushing Processes

22. (*a*) Every machine used for grinding or crushing caustic shall be enclosed, and (*b*) Where any of the following processes are carried on: (i) Grinding or crushing of caustic; (ii) packing of ground caustic; (iii) grinding, sieving, evaporating or packing in a chrome process; (iv) crushing, grinding or mixing of material or cartridge filling a nitro or amido process; an efficient exhaust draught shall be provided.

23. (*a*) Chlorate shall not be crystallised, ground or packed except in a room, or place not used for any other purpose, the floor of which room or place shall be of cement or other smooth, inpervious and incombustible material, and shall be thoroughly cleansed daily. (*b*) Wooden vessels shall not be used for the crystallisation of chlorate, or to contain crystallised or ground chlorate; provided that this regulation shall not prohibit the packing of chlorate for sale into wooden casks or other wooden vessels.

24. No person under 18 years of age shall be employed in a chrome process or in a nitro or amido process.

Protective Clothing

25. (*a*) There shall be provided and maintained for the use of all persons employed in: (i) A nitro or amido process, sufficient and suitable overalls or suits of working clothes and sufficient and suitable protective footwear; (ii) grinding raw materials in a chrome process, sufficient and suitable overall suits; (iii) the crystal department and in packing in a chrome process, sufficient and suitable protective coverings; (iv) packing in a chrome process, sufficient and suitable respirators; (v) any room or place in which chlorate is crystallised, ground or packed, clothing of woollen material and boots or overshoes, the soles of which shall have no metal on them; (vi) any room or place in which caustic is ground or crushed by machinery, sufficient and suitable goggles and gloves, or other suitable protection for the eyes and hands; (vii) bleaching powder chambers, or in packing charges drawn from such chambers, a supply of flannel or other suitable respirators. (*b*) (i) The overalls or suits of working clothes required to be provided by (*a*) (i) and (ii) of this regulation shall be washed, cleansed or renewed at least once every week; (ii) the filtering material of the respirators required to be provided by (*a*) (iv) of this regulation shall be washed or renewed daily; (iii) the woollen clothing required to be provided by (*a*) (v) of this regulation shall not be removed from the works for any purpose, but shall be washed daily after use and thoroughly dried before being worn again; all such clothing when worn out shall be destroyed; (iv) if gloves are provided to comply with (*a*) (vi) of this regulation, they shall be collected, examined and cleaned at the close of the day's work, and shall be repaired or renewed when necessary.

Sodium Hyposulphite Inquiry

Referee's Decision against Complainants

THE following is the substance of the Referee's decision with regard to the complaint under Part I of the Safeguarding of Industries Act that sodium hyposulphite has been improperly included in the list of dutiable articles issued by the Board of Trade :—

Sodium hyposulphite, said the Referee, was put on the market in two forms and under two descriptions. There was the ordinary quality known as commercial, which was in the form of large crystals of different shapes and sizes ; there was no standard of purity or colour to which it was expected to conform. There was also the quality known as pea crystals. The material was in the form of small crystals uniform in shape and size. Again there was no fixed standard of purity or colour to which it must conform, but it was expected to be clear, dry, and a very good white. In practice analysis showed that the percentage of purity varied from 99 and 99.5 per cent. At times even a higher degree of purity was obtained. The material was very largely used in photography, and the demand for this purpose had led to the introduction of the description " photographic " quality. That description implied that the material was of the highest quality put on the market. To answer that description the material must be in the small crystal form, of very good colour, dry and of a purity not less than 99 per cent.

It was not disputed that sodium hyposulphite was an analytical re-agent. It was in common use, and would find a place in any list of analytical re-agents. The quality used for this purpose was the best obtainable, *i.e.*, the photographic quality.

Sodium hyposulphite has been included in the Board of Trade's list with the letter " R " against it, meaning thereby that only the highest quality is to be dutiable under the Act. This inclusion in the list is justified by the Board of Trade on the ground that sodium hyposulphite of photographic quality is (1) an analytical re-agent and/or (2) a fine chemical.

The Referee did not see how the complainants could be right in holding that synthetic chemicals and analytical re-agents were in the schedule only if they were fine chemicals, quite apart from their claims to that description as being synthetic in the one case or analytical re-agents in the other, would be to give no effect to the words preceding " all other fine chemicals."

Protecting Fine Chemicals

Some weight must be given to the word " other," and, in his opinion, the interpretation which gave effect to all the words used was that the legislature intended to protect the fine chemical industry, but the expression " fine chemical " was very vague. The legislature deliberately avoided attempting to define " fine chemical," but it was intended that there should be no mistake about the inclusion within that phrase of synthetic organic chemicals and analytical re-agents. The specific inclusion of these chemicals indicated in his opinion that the words " fine chemicals " were intended to be used in a sense wide enough to cover the classes mentioned. Parliament was content to leave the further application of the expression " fine chemicals " to the Board of Trade, and to a Referee, but their hands were to be tied in respect of such chemicals as could with reasonable certainty be described as synthetic organic chemicals or analytical re-agents. As this view seemed to him the right one, the Referee thought it unnecessary to determine whether or not sodium hyposulphite was a fine chemical independently of its being an analytical re-agent.

In his opinion, once it was conceded that sodium hyposulphite was an analytical re-agent in regular use, the complainants' case fell to the ground, and he had no option but to award that the substance in question in its purest form was rightly included in the list as an analytical re-agent. Only the purest form of the chemical was within the schedule. It was only that form which was used as a chemical re-agent.

The Referee thought it was advisable to be a little more definite as to what was meant by the letter " R " in this particular case. It was stated on behalf of the Board of Trade that only the quality known as " photographic " was intended to be included, and he thought that it would be wiser to state that in the list. He wished it to be clearly understood that the mere fact that sodium hyposulphite was in peacrystal form did not prove that it was of photographic quality. In his opinion, photographic quality indicated that the chemical was in the form of small uniform crystals, that it had great purity of colour, and was of 99 per cent. (or thereabouts) purity and upwards. No objection was offered by the Board to the addition of the words " photographic quality."

He therefore awarded that the list be amended by inserting after the words " sodium hyposulphite " the words " photographic quality."

The complaint failed, and no order was made as to costs.

Chemical and Dyestuff Traders' Association

In a circular commenting on the above decision the Chemical and Dyestuff Traders' Association state that the case has been fought by the National Vigilance Committee, of which several members of the Association are members. At first sight, the circular states, it would appear that we have lost the case, and whilst that is technically true, we would point out that from a practical point of view we have gained all that is necessary. Until the case was fought, H.M. Customs said that hyposulphite/soda pea crystals, irrespective of purity, was R Grade, but now the Referee clearly lays it down that crystallisation has nothing whatever to do with the matter. It is well known that hyposulphite/soda for photographic purposes need not be 99 per cent. or thereabouts—in fact many makes are considerably below this strength. In conclusion the opinion is expressed that members will find it possible to import hyposulphite/soda pea crystals of a sufficiently good quality to satisfy all photographic requirements but yet sufficiently under the standard laid down by the Referee to justify the admission of the product free of duty.

The Niger Company

Lord Leverhulme's Review of Colonial Trade

PRESIDING on Monday at the annual meeting of the Niger Co., Ltd., held at the Cannon Street Hotel, London, Lord Leverhulme said the directors regretted that to-day it was not possible to congratulate the shareholders on the result of the trading of the Niger Company and of its associated companies during the last two years. They need not be alarmed at this, however, for West African trade had had severely hard times to pass through many times in its past history, and had always recovered itself, and had resumed its interrupted course of prosperity, although, as far as memory or records served to show, it had never been so severely tried as during the last two years. Undoubtedly West African trade would recover again.

For over forty years, he continued, the Niger Company had played a leading and important *rôle* in the opening up and development of Nigeria, and also the West African Associated Companies which Lever Brothers had transferred to the Niger Company had played an equally important part throughout West Africa, from Dakar to the Congo, over a three-thousand-mile coast line, and extending over fifteen hundred miles inland. These West African Associated Companies had been established in West Africa from, in the case of one, over 150 years, and to over ten years for the youngest. The West African trade rested on the solid foundation that Great Britain, Europe and America could not well do without the produce of West Africa, and West Africa could not well do without the manufactured goods of Great Britain, America and Europe. In this connection he called attention to the wise and stimulating words of Mr. Bonar Law, that Great Britain could not wait for the settlement of Europe, but must proceed at once to develop her trade with her overseas Dominions and Colonies. He would add that there was no colony so ripe for this as West Africa.

Position Slowly Improving

Although the selling prices of produce exported from the coast still kept very low, and the depreciation in the rate of exchange had temporarily restricted the mid-European market with a serious effect upon the volume of trade, the position was gradually, though slowly, improving, and had been greatly helped by the clearing away of accumulated stocks. That branch of the company's trade which consisted of the sale to the natives of everything they required, was now in a much healthier state, with old stocks gradually sold or written down to represent replacement market values.

Respecting the loss for the two years which had been dealt with in the report, the Chairman said the severe depression in West African trade had not only affected the Niger Company, but had also affected each of its associated companies. The directors believed that they had taken the only proper course under the circumstances in assuming that for the present the low level of values would continue. As soon as a general appreciation took place, the company would reap the benefit, but the directors did not propose even then to write up any of its properties from their present low values.

Export Duties

The trading position in West Africa, continued Lord Leverhulme, had been aggravated by the fact that export duties were imposed on a tonnage rate basis, and the amount of duty too long continued at the same rate per ton, notwithstanding that the selling values of West African produce were less than half what they were when these export duties were imposed. It was not, perhaps, realised fully how great was this reduction compared with pre-war prices. To take two of the staple products, palm kernels and palm oil, the following table would show how the export duties, the excessive railway rates and freight had reduced the sum available for the producer and the merchants' profit. In the table, the cost of marketing included the export duty, the railway rates, freight and all other handling charges.

Palm Kernels (excluding the differential duty).	Pre-War. £ s. d.	To-day. £ s. d.
Average price	20 9 3	17 12 6
Average cost of marketing	6 9 0	10 6 6
Balance for producer and merchants	14 0 3	7 6 0
Palm Oil (Softs).		
Average price	30 12 6	33 0 0
Average cost of marketing	9 0 6	16 18 9
Balance for producer and merchants	21 12 0	16 1 3

Confidence in the Future

Lord Leverhulme said, in conclusion, that the directors were confident that the potentialities of the company were such that the ground which had been lost in the past two years would easily be regained when the rapidly approaching improvement in trade took place. No great changes could be looked for until the European exchanges became stabilised, and until the short-sighted over-taxation and squander-maniac expenditure of the Colonial Government was reversed, but there were signs of improvement visible in many quarters, and with returning confidence there was reason to hope that we should soon be experiencing a greater volume of trade at a fair margin of profit.

A Comprehensive Survey of Industry

The Larger View of Business

To the unenterprising and non-progressive business man this volume will hardly appeal. The first words of the preface are "To those who take the larger view of business," and these words might well have formed the dedication of the volume. However, we imagine that the book will be greatly appreciated by the growing body of commercial men who are taking this larger view and who realise that such a process does not merely imply the use of the latest office appliances or the institution of welfare schemes, but also hard thinking on their own part and gradually broadening views, such as will cause them to understand that an individual business is a small component part of the wonderful fabric of British trade, and that the control of any business is a matter not only of individual but also of national responsibility.

Mr. Philip Gee, the editor of the *Industrial Year Book for* 1922,* states in his preface that the volume has been compiled in order to fill a broad gap which has long been apparent in the literature of business. "There is," he says, "so far as can be discovered, no single work of reference comprising in detail within one pair of covers the salient facts and essential figures of British commercial activity throughout its whole range. . . . Admirable periodical publications, both general and specialised, are to be found giving day-to-day movements of commodity prices and market fluctuations, but there has hitherto been no work recording the actual conditions of trade in all its branches, reviewing the past, and assigning causes to current phenomena." It is to fill this gap that the *Industrial Year Book* has been compiled.

There is another point made by Mr. Gee in his preface in support of the "larger view of business" idea. All branches of trade, he says, are interdependent, and to the manufacturer who values a true perspective and sound judgment, accurate information about every industry is as necessary as is a knowledge of his own products. While it is impossible to emphasise too strongly the importance of such information, we imagine that there are still manufacturers in this country to-day who are unable to see the use of studying any businesses but their own and those of their immediate competitors. To such the *Industrial Year Book* will not appeal.

It will be evident from the foregoing that the editor set himself no small task in the compilation of this work, and he is to be congratulated on the fact that, although the book contains more than a thousand pages and deals with a large variety of subjects, it is easy for the reader instantly to put his finger upon the particular piece of information which he requires. The first chapter deals with "national wealth," and an introduction has been written by the Chancellor of the Exchequer. This is followed by detailed particulars concerning the nation's revenue and expenditure, the national debt, movements of capital, Government loans, banking, export credit schemes, and other matters in the realm of general finance. The principal industries of the country are then dealt with individually, the list comprising some thirty headings, including agriculture, shipping, mining, gas, chemicals, textiles, food and drink, and many others. To aid investigation along the lines to which reference has already been made, the information in many sections is given for the twenty-one years from the beginning of the present century.

* *The Industrial Year Book*, 1922. Edited by Philip Gee. London: Philip Gee. Price 36s.

Kelly's World Directory

A Valuable Aid for Chemical Exporters

Kelly's Directories, Ltd., of 186, Strand, London, are to be congratulated on the thirty-sixth annual edition of *Kelly's Directory of Merchants, Manufacturers and Shippers of the World*, which they have issued in two volumes at 64s. post free. Aptly described as "The Key to the World's Commerce," it is the most inclusive and most up-to-date guide to those engaged in every kind of trade the world over. The work consists of some 5,000 pages, giving information relating to 20,000 foreign and Colonial cities and towns, under which over 1,000,000 trade descriptions are given.

Only the very largest trading houses can afford to have representatives in every part of the world, and possibly not even the largest would undertake the expense of collecting the mass of information that is contained in *Kelly's Directory*.

The *Directory* is in two divisions, the first dealing with foreign countries, and their dependencies, while the second gives information concerning England, Scotland, Ireland and Wales, the British Dominions and Possessions. Under each town heading, carefully classified and alphabetically arranged, lists are given of all those engaged in trade, with the class of goods in which they deal.

To facilitate ease of reference a change is made this year in the arrangement of the Canadian Section. In the past this section was arranged in the order of provinces, each province subdivided into its towns. It was felt, however, that the system adopted in the U.S.A. section, of arranging the towns throughout the country in alphabetical order, would be of advantage, and this system has now been applied to Canada. The province in which each town is situated is given in the information concerning the town.

A feature of the British section is the inclusion, free of extra charge, of telephone numbers of firms and individuals, in addition to the telegraphic addresses; the *Directory* thus becomes a telephone and telegraphic address book of the principal firms in the United Kingdom. A new feature is the inclusion of the dates of Bank and Public Holidays throughout the world.

Rubber Research Association

Opening of the New Laboratories

On Wednesday, at 105-107, Lansdowne Road, Croydon, Surrey, the new laboratories of the Research Association of British Rubber and Tyre Manufacturers were opened by Lord Colwyn. Among those present were Sir William McCormick, Sir Frank Heath, Mr. Alexander Johnston (chairman of the Board of Management), Lieut.-Col. J. Sealy-Clarke, Dr. D. F. Twiss, Mr. B. D. Porritt, F.I.C. (Director of Research), Dr. H. P. Stevens, Mr. R. B. Pilcher, and others.

Before the formal ceremony, Mr. JOHNSTON, after referring to Lord Colwyn's intimate association with the rubber manufacturing industry, emphasised the national and international value of the industry and the multiplicity of uses to which rubber was even now being put in industry. The scheme under which they had been able to form the research association was a generous one and their thanks were due to the Department of Scientific and Industrial Research, particularly Sir William McCormick and Sir Frank Heath, for their great help in the matter.

Position of the Industry

Lord COLWYN, in declaring the laboratories open, referred to the hard times through which both the rubber growing and manufacturing industries had passed. He hoped that America would not decide to buy up our large rubber properties at present prices. Dealing with foreign competition, particularly that from Germany, Lord Colwyn said he thought that Germany had still a great deal of money, and he looked upon the Germany of to-day as a nation at least as wealthy as Great Britain. She therefore had sufficient means to go ahead and develop her industries. The public should be educated to buy British goods.

The premises were then open for general inspection. The laboratories consist of two buildings joined by a large connecting building providing intercommunication on the basement and first floors, on which are situated respectively laboratories for work of a technical nature and that of a physico-chemical character. One building has been kept entirely free from running machinery in order that it may be possible to employ delicate instruments without risk of any disturbance due to vibration, and throughout special attention has been directed to the general illumination of the rooms and the rigidity of the floors.

The basement has been devoted to work of an experimental character involving the use of heavy machinery. The maintenance of the premises and the construction of scientific apparatus and instruments necessitated provision being made for a small workshop. The work of all sections of the laboratory naturally requires the use of specimens of vulcanised rubber of varying composition and quality, prepared under careful supervision and control. The first stage in this work consists in the weighing out of the various ingredients, for which purpose a room has been allocated, provided with ample shelves for the storage of the various fillers, pigments, accelerators, etc., racks for rubber and reclaimed rubber, and a long bench for weighing, grinding and sieving the various ingredients.

Mill and Vulcanising Room

In the building connecting the two houses a miniature rubber factory has been installed, containing all the equipment necessary for the cleansing of the raw material to its vulcanisation by any of the methods ordinarily used in the industry.

With the completion of the manufacture of the rubber specimen the study of its physical and chemical properties begins, and of the various tests which may be employed, those for the determination of strength and elasticity bear the most obvious relationship to the normal conditions of usage. As cotton fabric enters largely into the composition of many rubber articles, it is also necessary to provide for carrying out strength tests on textile materials. The equipment so far installed for mechanical testing comprises a compound lever Avery cloth testing machine, a Schopper rubber testing machine with autographic stress-strain recorder, a Schopper rubber ring cutter, and a Schopper permanent set testing apparatus for rings. A number of other useful testing instruments, such as appliances for carrying out abrasion and hysteresis tests, have still to be added to the foregoing equipment, which, however, comprises all the more important items for the study of mechanical properties of rubber and cotton.

The eight rooms on the first floor of the building have been allocated to laboratories for physical and chemical work, and by the addition of another storey over the annexe this accommodation can be augmented at a later date by a large room.

For the time being, the installation of laboratories for general work has been restricted to the three rooms above the administrative offices, those in the north side of the building being reserved for conversion into specialised laboratories for X-ray work, constant temperature apparatus for ageing experiments and heat tests, etc. The general design of the building facilitated the conversion of the rooms into small laboratories, making it possible to provide a common balance room, a large fume cupboard entirely outside the building, whilst the attics, being readily accessible to each laboratory, were admirably suited for conversion into apparatus and chemical stores.

Chemical Laboratories

In designing the benches and fittings for the two rooms assigned to chemical work, special attention was directed to cleanliness, simplicity, and the need for ensuring accessibility to all service pipes and wastes. For these reasons, the pitch pine, teak-topped, window benches have been left open underneath, thus rendering easy the inspection and cleansing of the cast-iron collecting channels into which the small waste hoppers discharge. The drainage from each laboratory is trapped before it passes outside the building, and it is therefore possible to employ heavy standard rain-water piping for the external system in place of the more expensive lead or earthenware usually used. Plate-glass has been used for the construction of the reagent shelves, and an interesting feature is the portable sand-filled extraction table which has been designed to eliminate the risk of fire and damage to woodwork incidental to experiments involving the use of inflammable solvents.

The general design of the Physics Laboratory corresponds with that employed in the chemical laboratories, with the exception that, instead of a wide bench, a narrow strip of teak has been employed, sufficient to carry the drainage system, against which portable teak-topped tables can be placed where most convenient for the work in progress.

The Balance Room

In the Balance Room are situated the accurate balances required for chemical and physical work. These stand on a slate-topped table seated in sand to obviate the effects of vibration, and on the opposite wall an N.P.L. standard Fortin barometer has been installed in a convenient position for reading. The space on the lower half-landing has been employed to accommodate a combined drying oven and still heated by gas. This arrangement provides for the drying of apparatus, precipitates, etc., at about 95° C., and for a constant supply of distilled water for laboratory use.

By opening up the upper half-landing it has been possible to construct a fume cupboard entirely shut off from the main building. The woodwork consists of pitch pine and the bench of reinforced concrete surfaced with granolithic, the upper portions of the cupboard being covered with uralite sheet to withstand the corrosive action of fumes.

The three rooms above the general laboratory have been transformed into stores for the accommodation of general apparatus, chemicals, and large apparatus respectively, whilst the ample space on the landing will be utilised for the storage of stationery supplies, letter file cases, etc. A deal cupboard, extending the whole length of the room, fitted with drawers and smaller cupboards, has been installed for the accommodation of miscellaneous laboratory supplies, whilst one side of the room is occupied by a rack fitted with wire shelves to hold the general glass apparatus. The equipment is completed by a large glass-fronted cupboard for delicate apparatus which requires protection from the effects of fumes and dust.

In the chemical store, which also contains the water storage tank, shelving has been run round the walls to accommodate the general laboratory reagents and chemicals and the various standard solutions employed in volumetric analysis. A cupboard with numerous compartments has also been installed in order that samples, after examination in the laboratory, may be kept for a reasonable period for reference purposes.

Chemical Matters in Parliament

Reparation Duty

Lieut.-Col. A. Murray was informed by Sir John Baird (House of Commons, July 18) that over £5,000,000 has been collected from the German Government by means of the Reparation (Recovery) Act in a little over a year.

Nigerian Palm Kernels

Mr. Churchill, in reply to Dr. Murray (House of Commons, July 25), said that in May the average price of palm kernels at Lagos was about £11 per ton. The export duty was £2 a ton; so that the export duty was about 18 per cent. of the then average Lagos price.

Gas Mantles

In reply to Major Barnes (House of Commons, July 25), Sir R. Horne said the amount of Key Industry Duty collected up to July 1 in respect of dutiable ingredients in incandescent gas mantles was £232. He would point out that the award of the Referee in this matter was not signed until May 17 last.

Importation of Cocaine

In answer to Dr. M'Donald (House of Commons, July 24), Mr. Shortt said that licensed importers of cocaine were required to keep records of their sales, and these records were inspected from time to time. The records would not show, however, the areas to which the drug was eventually distributed, as it might pass through several hands, wholesale chemist, manufacturing chemist and others, before it reached the medical practitioner, dentist or other person by whom it was used.

Part II. Complaints

Mr. Baldwin informed Mr. Galbraith (House of Commons, July 24) that five complaints in which dumping, in the sense of Section 2 (1) (*a*) of the Act, was alleged had been received since the coming into force of Part II. of the Act in August, 1921. Of these, two had been referred to Committees; one was rejected on the ground that no *primâ facie* case was established; and as regards the other two, the complainants had been asked to furnish further information.

Sodium Hyposulphite

Answering Dr. Murray (House of Commons, July 24), Mr. Baldwin said he had studied the judgment given by the Referee in the sodium hyposulphite case. It embodied no suggestion that the exact meaning and scope of the letter R, as used in the lists issued under Section 5 of the Safeguarding of Industries Act, should in general be defined. The Referee did, however, say that it was advisable to be a little more definite as to what was meant by the letter R in this particular case.

Norwegian Cement

Replying to Mr. James Wilson (House of Commons, July 17), Mr. Baldwin said the prices publicly quoted for bulk consignments of British cement during 1921 were slightly below the average declared value of imported Norwegian cement; the price of British cement and the average value of imported Norwegian cement had both fallen in the present year, but continued to approximate closely. He had no power to secure that Norwegian makers would continue to send consignments of cement to this country.

Safeguarding Act: Part II. Orders

In reply to Captain Wedgwood Benn (House of Commons, July 24), Mr. Baldwin said that action would be taken as rapidly as possible on any Reports which might be received from Committees under Part II. of the Safeguarding of Industries Act. He was unable to say in advance how far, if at all, it would be necessary to make Orders during the Recess. Any Orders so made were subject to confirmation, in accordance with Section 2 (4) of the Act. He would do all he could to give the House every opportunity for debate on these matters, but occasions might arise after the end of the Session when it might be necessary to make Orders.

Applications for Patents

In reply to Captain Wedgwood Benn (House of Commons, July 14), Sir W. Mitchell-Thomson said he regretted that there had been some delay in dealing with applications for patents. This was largely due to the arrears of work caused by war conditions, and the inevitable depletion of the staff for military service and other public work. There had also been an increase of applications since the war, which amounted now to an average of 35,000 yearly, as compared with 30,000 in 1913. The arrears had been considerably diminished during the last two years, and every effort was being made to bring about a return to normal conditions.

Scheduled Articles

Replying to Dr. Murray (House of Commons, July 24), Mr. Baldwin said that seven articles had been deleted from the list of dutiable articles under the Safeguarding of Industries Act by direction of the Referee, and, in accord with what the Board understood to be the general views of the Referee, 24 items had, on the Board's responsibility, been deleted and the standard of the dutiable grade of 10 other listed chemicals had been raised. In the case of certain of the deletions the action of the Board had been challenged by persons interested. One item had been added to the list by direction of the Referee. In nine other cases of complaint the action of the Board was upheld by the Referee.

Poison Gas

Mr. L. Malone (House of Commons, July 24) asked the Prime Minister whether the Government had received information to the effect that the War Department at Washington had ordered the discontinuance of the manufacture of poison gas; whether Britain was spending £169,700 this year on preparing gas-warfare as compared with £53,870 two years ago; and whether, with a view to bringing British policy into harmony with the Bill based on Article V. of the Treaty signed at Washington on February 6, recently passed by this House, the Government would discontinue the manufacture of poison gas in this country.

The Prime Minister said the Government understood that the War Department at Washington had recently ordered the discontinuance of the manufacture of poison gas for the purpose of equipping the United States Army for waging gas warfare, but that at the same time Congress had sanctioned the continuation of research and experimental work in connection with poison gas. Our proposed expenditure for 1922-23 was as stated. This was to allow for research and experimental work in connection with protective measures against gas attack. We had discontinued the manufacture of poison gas in this country since the Armistice, except in small quantities necessary for such research and experiment.

New Industries

Mr. Briant (House of Commons, July 24) asked the President of the Board of Trade if he could give any information as to the number of new industries or new factories, or additional employment in the various industries in the trades concerned with the production of the 6,300 commodities specified in the Board of Trade list of articles dutiable under the Safeguarding of Industries Act.

Mr. Baldwin said it was not possible to make any detailed statement on this subject at present, and in view of the fact that the Act had been in operation for less than 10 months, and of the general trade conditions which had prevailed during that period, any such statement, even if possible, would be liable to be misinterpreted. But marked developments had taken place in the range of production of the branches of the chemical industry covered by the last heading of the Schedule to the Act, which account for the greater number of the items in the list issued thereunder, and distinct progress was being made also in respect of scientific glassware and optical and scientific instruments. He would add that there was no doubt that in a number of cases the Act had encouraged manufacturers to keep in operation works which would otherwise have been shut down. In reply to further questions by Mr. Hannon and Mr. Kiley he said he had no doubt that a large number of people had been kept in employment by the operation of this part of the Act. He was not aware that one newly established glass factory would be under the necessity of discharging a number of its employees because they could not obtain a rebate on the glass tubes they imported for the purpose of manufacturing bottles.

From Week to Week

THE JOSEPH DIXON CRUCIBLE CO., LTD., announce the removal of their offices to 22, Duke Street, Stamford Street, London, S.E.1.

A message from Melbourne states that Mr. W. G. DUNCAN is joining the board of the Broken Hill Proprietary Co., Ltd., in place of the late Mr. D. E. McBryde.

Dr. J. C. DRUMMOND, F.I.C., has been appointed to the Chair of Biochemistry, tenable at University College, London. The appointment takes effect from August 1.

It is reported that the Anglo-Persian Oil Co., represented by Mr. G. Tacon, has obtained from the Greek Government the PETROLEUM RIGHTS over the whole of Macedonia.

Under the presidency of Professor H. G. Greenish, F.I.C., the BRITISH PHARMACEUTICAL CONFERENCE opened in Nottingham on Monday. The proceedings terminated yesterday (Friday) in athletic pursuits.

At the last meeting of the Senate of London University THE DEGREE of Doctor of Science (Physics) was conferred on Messrs. W. E. Curtis (King's College), B. A. Keen (University College), F. H. Newman and H. R. Nettleton.

It is reported that the CHEMICAL INDUSTRIES in Italy are anxiously awaiting the decision of the Government on the question of the reparations in kind to be secured from Germany, as the fate of the dye works will depend largely on the action taken.

MR. E. NORTON GRIMWADE, of Felton, Grimwade and Co., wholesale chemists, Flinders Lane, Melbourne, Australia, is at present spending a holiday in the United Kingdom. His firm is represented in London by Grimwade, Ridley and Co., St. John's House, Minories, London.

According to reports from Amsterdam the directors of the Royal Dutch Oil Co. intend to call together shortly a conference of those interested in the OIL INDUSTRY, so that they may have the opportunity of deliberating what can be done for the commonweal of all those having an interest in the oil trade.

According to an Agencia Americana message from Rio de Janeiro, the IMPORTATION OF CEMENT for 1921, which shows an appreciable increase, amounted to 157,000 tons, and was exported by the following countries: Germany, 83,000 tons; Great Britain, 22,000 tons; Belgium, 11,000 tons; other countries, 41,000 tons.

Presiding on July 21 at the annual meeting of the Libiola Copper Mining Co., Ltd., MR. T. V. ANTHONY said the labour troubles in Italy had been extensive, and the company had been unable to prosecute development work, but it was hoped that important work would soon be carried out to deal with copper deposits which were known to exist on the estate.

Several important SULPHATE OF SODA DEPOSITS are reported to have been discovered in Sicily. One of these deposits is at Bompensiere, in the province of Caltanissetta, while the other is in the vicinity of Calascibetta, in the same province. The former deposit is said to consist principally of Glauberite, a combination of sulphate of calcium and sulphate of sodium.

It is reported through the Berlin correspondent of the Exchange Telegraph Co. that the Norwegian Raw Materials Committee, which has been working on the potash question since 1917, has discovered that the POTASSIUM-CONTAINING MICAS which are found all over Norway can be used in a crushed state for fertilisation purposes. Experiments are still being conducted.

Mr. Thomas C. Ansdell, of Harrison Blair and Co., Ltd., manufacturing chemists, Kearsley Chemical Works, Farnworth, near Bolton, has felt it necessary, owing to advancing years and after a connection of 60 years with the firm, to resign his position as chairman and director of the company. Mr. A. H. Chadwick has been appointed a director of the company and along with Mr. Frank Warburton will carry on the business.

At a meeting of the Council of the Swansea University College last week the resignation was accepted, with regret, of Mr. D. G. HOPKINS, B.Sc., assistant lecturer in chemistry. It was reported that the Department of Scientific and Industrial Research had decided to make maintenance allowances to enable Messrs. A. J. Murphy, E. R. Owen, and W. E. Prytherch, students of the college, to receive training in scientific research in the Metallurgy department next session under the direction of Professor C. A. Edwards.

A number of advanced evening courses in technology are being organised for the coming session at the UNIVERSITY OF LEEDS. Students who are under the age of twenty-two are required to produce evidence of adequate preparation for the courses or to pass an entrance examination before they will be admitted. Courses are held in civil, mechanical, electrical, and gas engineering, coal mining, colour chemistry and dyeing, fuel, metallurgy, geology, etc. Many of the courses are specially suitable for those desirous of undertaking research work.

Speaking on July 21 at the annual meeting of the Reliance Fuel Co., Ltd., MR. HOWARD HOULDER (chairman of the company) said that owing to the general depression in trade and adverse exchanges in countries where patent fuel was largely used, the demand for the company's products had so far not reached expectations, but the situation was improving, and the foreign demand would be an expanding one. Thus, with the usual seasonal home demand, there should be no difficulty in obtaining a ready sale. To assist the development of the business, control had been obtained, subject to the confirmation of the court, of a well-known fuel works at Swansea.

As the result of a meeting between the Council of the British Association of Chemists and representatives of the National Union of Scientific Workers it was agreed (1) to take adjacent offices for their separate activities; (2) to establish a joint office for common activities; (3) to allocate funds for common activities; (4) that local branches and sections shall hold joint meetings for the purpose of discussion of common interests and co-ordinating work; and, (5) that Major Church shall act as secretary to the joint committee. A meeting of the Joint Committee will be held early in September, when matters of policy will be discussed and a PROGRAMME OF JOINT ACTIVITIES formulated.

TWO FRECHEVILLE RESEARCH FELLOWSHIPS are being offered by the Imperial College of Science and Technology, South Kensington, to aid in carrying out any investigation or research connected with mining, mining geology, metallurgy, or the technology of oil, which, in the opinion of the Selection Committee, is of sufficient use or promise. Each fellowship will be of the annual value of £300, tenable for one year, with a possible renewal for a second year, and the holder will be expected to devote his whole time to the work of the fellowship. Further particulars may be obtained from the secretary of the College, and all applications must be lodged with him before September 1, information being furnished at the same time as to the qualifications of the applicants and the nature of the proposed investigations.

It is announced that the Ministry of Health are arranging for a large-scale test at Manchester and Bury of a theory that blue dyes may be of use in expediting the development of the ACTIVATED SLUDGE PROCESS of sewage purification. The advantage of sludge treatment, a Ministry official explained, is that it allows the work to be done quicker and in a smaller space than formerly. The trouble is that, at one stage of the operations, the sludge will not settle, possibly because protozoa attack the bacteria as they perform the work of purification. At any rate, one result of recent investigations made at Manchester into the effect of dyestuffs on disease germs was to show that certain blue dyes could kill off these protozoa without harming the bacteria. It is claimed that, in this way a constant and useful concentration of bacteria can be maintained at the minimum of trouble and expense.

A New York telegram announces the death of DR. JOKICHI TAKAMINE, the well-known Japanese chemist. Born at Takaoka, Japan, in 1854, Dr. Takamine, after studying chemistry in Japan, came to study at Glasgow, and then, returning home in 1881, was appointed head chemist to the Japanese Department of Agriculture and Commerce. He settled down in the United States in 1890, having married an American lady, Miss Caroline Hitch, in 1887. He was well known for his research, having discovered the diastatic enzyme known as takadiastase and used as a starch digestant, and isolated the active principle of the suprarenal glands in the product known as adrenalin. Dr. Takamine was consulting chemist to Parke, Davis, and Co., and president of the Takamine Laboratory, Inc., the Takamine Ferment Company, the International Takamine Ferment Company, and the Sankyo Company (Tokio).

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HYDROAROMATIC COMPOUNDS.—Furfural-α-methylcyclohexamone and some of its derivatives, and mono- and difurfuralcyclohexamones. N. Wolff. *Compt. rend.*, June 6, 1922, pp. 1469–1471.

FERTILISERS.—The accessory elements in phosphate slags. A. Demolon. *Compt. rend.*, June 26, 1922, pp. 1703–1706.

ALCOHOLS.—The transformation of tertiary ethylenic alcohols (linalol series) into primary ethylenic alcohols (geraniol series). R. Locquin and S. Wouseng. *Compt. rend.*, June 26, 1922, pp. 1711–1713.

The preparation of dialkylvinylcarbinols. R. Locquin and S. Wouseng. *Compt. rend.*, June 12, 1922, pp. 1551–1553.

REACTIONS.—Action of thionyl chloride on α-hydroxy-acids. E. E. Blaise and M. Montagne. *Compt. rend.*, June 12, 1922, pp. 1553–1555.

The action of trimethylene chloro-bromide on some aliphatic ketones. H. Billon. *Compt. rend.*, June 26, 1922, pp. 1708–1711.

ARSENIC COMPOUNDS.—Magneto-chemical investigation of constitutions in inorganic chemistry. Arsenic acids. P. Pascal. *Compt. rend.*, June 26, 1922, pp. 1698–1700.

HALOGEN COMPOUNDS.—The chlorhydrin of mesityl oxide and its transformation into the chlorhydrin of tetramethylglycerine. M. Pastureau and H. Bernard. *Compt. rend.*, June 12, 1922, pp. 1555–1557.

Monochlorotoluenes. A. Wahl, G. Normand and G. Vermeylen. *Bull. Soc. Chim.*, June, 1922, pp. 570–583.

OILS.—Properties of castor oil and its industrial uses. Doluis. *Rev. Chim. Ind.*; Part I, May, 1922, pp. 149–152; Part II, June, 1922, pp. 177–180.

CEMENTS.—The manufacture of Portland cement. Part I. J. Dantrebande. *Rev. Chim. Ind.*, June, 1922, pp. 184–187.

Miscellaneous

ALCOHOLS.—Investigation of 3-butenol-2. J. Baudrenghien. *Bull. Soc. Chim. Belg.*, May, 1922, pp. 160–170.

ANALYSIS.—Estimation of uranium in the presence of phosphoric acid. A. Schoep and W. Steinkuhler. *Bull. Soc. Chim. Belg.*, May, 1922, pp. 156–159.

The use of potassium ferrocyanide in electrometric titrations. Part II. The titration of zinc. I. M. Kolthoff. *Rec. Trav. Chim. des Pays-Bas*, June 15, 1922, pp. 425–437.

NITRILES.—Butene nitriles. P. Bruylants. *Bull. Soc. Chim. Belg.*, June, 1922, pp. 175–184.

The action of organo-magnesium compounds on nitriles. F. Baerts. *Bull. Soc. Chim. Belg.*, June, 1922, pp. 184–192.

PROTEINS.—Studies on the proteolysis of proteins. G. Chabot. *Bull. Soc. Chim. Belg.*, June, 1922, pp. 193–204.

RESINS.—The constituents of resins. Parts VIII and IX. A. Zinke. *Monats. für Chem. (Vienna)*, May 15, 1922, pp. 439–452.

Patent Literature

Abstracts of Complete Specifications

181,750. New Series of Soluble Acid Colouring Matters and New Series of Intermediate Compounds for their Manufacture. A. G. Green and K. H. Saunders, Crumpsall Vale Chemical Works, Blackley, Manchester, and British Dyestuffs Corporation, Ltd., Imperial House, Kingsway, London. Application dates, December 18, 1920, and August 16, 1921.

Insoluble or insufficiently soluble colouring matters, and insoluble azo dyes are usually converted into soluble dyestuffs by the introduction of one or more sulphonic acid groups (SO_3H) into the hydrocarbon nucleus. A new class of dyestuffs of the benzene and naphthalene series has now been found, which dye wool and silk from an acid bath, and which are rendered soluble and acid by the introduction of the alcoholic sulphuric acid group $C_2H_4.SO_4H$ attached to nitrogen. The dyes are produced by treating a dyestuff of the benzene or naphthalene series containing one or more oxyalkyl groups attached to nitrogen, with concentrated sulphuric acid, or these reactions may also be applied to intermediates. Components or intermediates may be manufactured by treating an aromatic amino compound containing a free position in an amino group with a chlorhydrin to introduce an oxyalkyl group, and then treating the oxyalkylated substance with concentrated sulphuric acid. Numerous examples of the preparation of the new dyestuffs and intermediates are given.

181,775. Titanium Dioxide from Bauxite, Process for the Preparation of. E. E. Dutt and P. C. Dutt, 8, Argyll Road, Kensington, London, W.8. Application date, February 18, 1921.

A mixture of one part of finely powdered bauxite and five parts of ammonium sulphate is heated to 350°–400° C. under a pressure of 3–4 atmospheres. Ammonia and water vapour are evolved, and double sulphates of ammonia with alumina and iron are produced. The mixture is then treated with water to dissolve out these sulphates, leaving the silica and titanium dioxide unaltered. The titanium dioxide is in the form of a very fine suspension in the solution of sulphates, and may be decanted from the silica and undecomposed bauxite which settle out. The titanium dioxide may then be filtered from the solution. The process is suitable for treating bauxite rich in titanium dioxide such as that from Central India, and the product is suitable for the manufacture of pigments.

181,802. Rubber, Process for Heat Vulcanisation of. R. Wheatley, "Balinard," Davidsons Mains, Edinburgh, and the Victoria Rubber Co., Ltd., Victoria Indiarubber Mills, Leith Walk, Edinburgh. Application date, March 17, 1921.

The high pressure steam usually employed for heating cylinders, presses, autoclaves, and dry heat chambers used in the vulcanisation of rubber, is replaced by a high-boiling liquid such as aniline or nitrobenzene.

181,835. Liquid Esters of Phosphoric Acid, Manufacture of. A. G. Bloxam, London. From Chemische Fabrik Griesheim-Elektron, Frankfurt-on-Main, Germany. Application date, March 22, 1921.

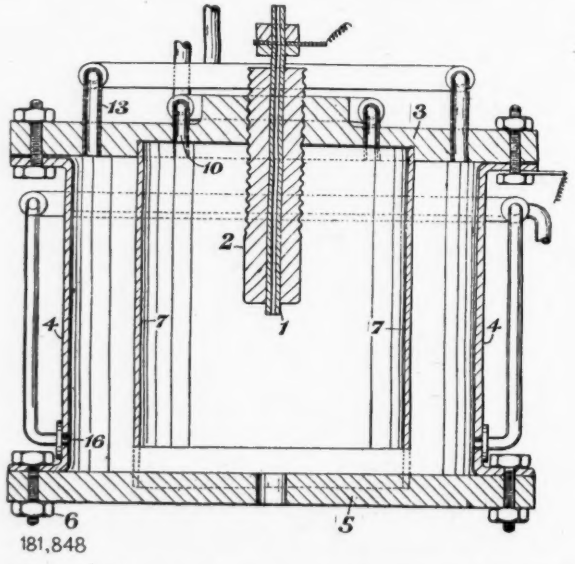
These phosphoric esters are slightly fluorescent viscous oils suitable as softening agents in the manufacture of plastic materials. The esters are produced from phenol and its homologues or from the homologues alone. The starting materials are either artificial mixtures of phenols containing 25–30 per cent. of ortho or meta cresol, or the acid oils containing mixed monovalent phenols with at least 25–30 per cent. of ortho or meta cresol and their homologues, which are produced from coke-oven tar or gasworks tar, low-temperature tar, mineral coal tar or brown coal generator tar. The esters are obtained by the action of chlorine or oxygen compounds of phosphorus such as the oxychloride or phosphoric anhydride. In a modified process, the phosphoric di- or mono-chlorides are first prepared from single phenols or mixtures thereof, and these are converted into the neutral esters.

181,837. Tungsten and Molybdenum, Reduction of Oxides of. R. E. Pearson and E. N. Craig, Duram Works, Nightingale Road, Hanwell, London, W., and Durelco, Ltd., Thanet House, Strand, London, W.C.2. Application date, March 22, 1921.

The process is for reducing tungsten and molybdenum oxides for use in the preparation of pressed and sintered bars. The usual process of reduction with hydrogen is open to the objection that it is necessary to use the pure oxide free from sodium, iron, etc., the process is expensive, and the reduced metal is easily brought into a condition when it cannot be pressed or sintered. In this invention, the trioxide WO_3 or MoO_3 is first reduced to a lower oxide. The oxide is powdered and mixed with an electrolyte in which it is insoluble, such as sulphuric acid of a specific gravity 1·2, to form a paste, and this is electrolysed in a porous cathode chamber. The cathode preferably consists of a number of thin nickel-chromium rods, and the anode of a rod of lead. The anode is preferably placed in a porous chamber packed with waste molybdenum which is oxidised by the electrolysis, and the oxide may then be used for the production of fresh molybdenum powder. The temperature should be about 40°–60° C. with an anode current density of about 0·28 amps. per sq. cm., and a cathode current density of about 0·10 amps. per sq. cm. at about 6 volts. The reduction is not continued beyond the lower oxide stage, and this oxide is then washed free from acid and impurities, and may then be reduced by means of hydrogen. It is found that the presence of zinc sulphate in the electrolyte facilitates the reaction.

181,848–9. Electro-chemical Reactions, Processes and Apparatus for. G. Plauson, Huxter 14, Hamburg 8, Germany. Application date, March 24, 1921.

181,848.—The apparatus is of the kind in which an anode having a small surface is used, so that it is heated to a high temperature by the passage of the current. The anode consists of a tube 1 projecting through and slightly below a porcelain plug 2 in the cover 3 of the cell. The outer wall of the cell 4 forms the cathode, and is secured to the cover 3 and



181,848

base 5 by bolts 6. A porous diaphragm 7 projects downwards from the cover 3 nearly to the bottom of the cell. Gases are drawn off from the anode compartment by pipes 10, and from the cathode compartment by pipes 13. The required level of the electrolyte is maintained by overflow pipes 16. In some cases in which the anode and cathode compartments must be kept entirely separate, the diaphragm 7 may extend to the bottom. The current is preferably such that the anode is

maintained at a glowing temperature. This apparatus renders it possible to liberate oxygen, or oxygen and a halogen, to react with substances in the anode compartment. Paraffin and other hydrocarbons can be converted into fats of the class of naphthene acids, brown coal or lignite can be converted into substances resembling montan wax, and resin oils can be converted into resinous acids. In alkaline electrolytes, oxidising reactions may be effected yielding acids, aldehydes or ketones. Liquids or solids which are not electrolytes may be dissolved in organic solvents and oxidised, and gases can also be treated. Methane may be converted into formaldehyde, methyl alcohol or formic acid, and acetylene into acetaldehyde or acetic acid. An electrolyte may be used which evolves halogens at the anode, and the material to be treated is supplied through the tubular anode, so that gaseous and liquid hydrocarbons may be halogenated. Examples are given in which the oils obtained from brown coal or lignite are converted into saponifiable fatty acids, using sodium bisulphate as an electrolyte, with an anode of platinum, graphite or lead. Petroleum obtained from Caucasian mineral oil may be similarly treated to obtain naphthene di-sulphonic and other acids. The process may also be used for fixing atmospheric nitrogen. In this case, the electrolyte consists of aluminium, magnesium, calcium or barium chloride, with or without a salt of chromium, tungsten, or vanadium. The anode consists of platinum, silicon or silicon alloy, and nitrogen or air is passed through it. Nitrates are formed in the electrolyte, and a good yield is obtained. The anode in this case is preferably closed at the end, but is perforated with very small holes of 0·5 to 0·05 mm. diameter.

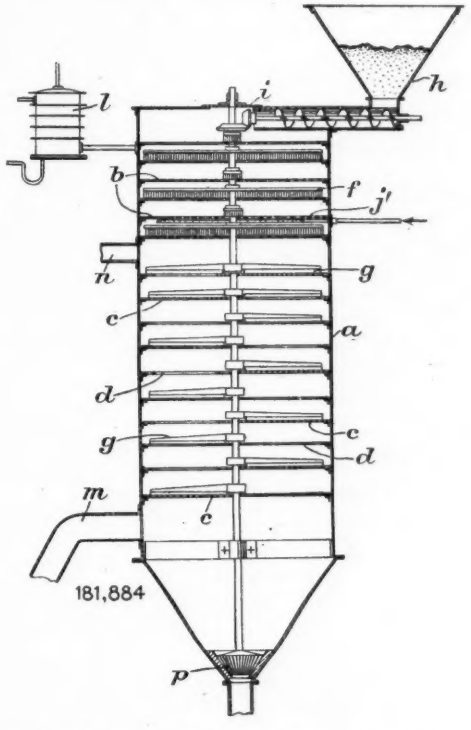
181,849.—The apparatus used is the same as that described in 181,848 above, but the tube 1 is made the cathode. The current density at the cathode is preferably such that it is heated to a glowing temperature. Examples are given in which tar oil is emulsified with soda or potash lye. A strong concentration of hydrogen takes place at the cathode, or if the temperature is raised to 500°–650° C. sodium may be liberated. The oil is cracked and hydrogenated, and lower boiling oils are obtained. Raw naphtha oil and heavy oils are similarly treated, and in this case a viscous residue suitable for lubricating purposes is obtained, but no pitch. The process may also be applied to the treatment of coal, peat, or cellulose, suspended in alkali. Benzol may be obtained from phenols, and organic fatty acids from carbon monoxide and dioxide. Polymerisation and condensation reactions may also be effected. If a salt of platinum, palladium, nickel, iron, copper or mercury be added to the electrolyte, it is reduced to the metal which then acts as a catalyst. The cathode itself may be composed of iron, nickel, platinum, iridium or osmium.

181,877. Mixing, Reducing or Grinding and Like Machines. J. McIntyre, 28, Brighton Place, Portobello, Midlothian, Scotland. Application date, April 6, 1921.

The material is ground in the space between two coaxial cylinders which rotate relatively to one another. The inner cylinder carries flexible metal blades fixed to it at one end, the free end being continually in rubbing contact with the inner surface of the outer cylinder.

181,884. Sulphate of Ammonia, Manufacture of Dry Neutral. The Ebbw Vale Steel, Iron and Coal Co., Ltd., Ebbw Vale, Monmouth, and D. Thickins, 57, Alma Street, Abertillery, Monmouth. Application date, April 9, 1921.

A vertical cylinder *a* is provided near the top with a number of sieves *b* of about one-eighth inch wire mesh, and below these are arranged circular shelves *c* each having a radial slot *d*. The slots in adjacent shelves are arranged out of line with one another, or alternatively, the shelves may be perforated uniformly over their surfaces, or over regions which are arranged out of line with one another. The sulphate of ammonia crystals are fed from a hopper *h* to a conveyor *i* and thence to the uppermost sieve *b*. A vertical shaft is arranged centrally in the cylinder and may be geared with the conveyor. The shaft carries brushes *f* which sweep over the sieves, and scrapers *g* which sweep over the shelves, so as to cause the sulphate to travel downwards in a finely divided state. Ammonia vapour, steam, and warm air are admitted through a perforated pipe j^1, and the sulphate is neutralised. The waste gas passes to a vessel *l* where pyridine is absorbed. An



inlet *m* and outlet *n* are provided for hot drying air to dry the neutralised salt, which finally passes through a grinding device *p*.

181,984. Sulphur, Metallic Sulphides and the like, Process for Recovering from a Condition of Emulsion Without Filtration or Evaporation. B. Hunt, 16, South Street, London, E.C. Application date, March 16, 1922.

An emulsion containing sulphur, gangue and the like is heated under pressure in an autoclave above the melting point of the sulphur. Under these conditions the melted sulphur separates from the gangue which remains in suspension in the liquid. Any metallic sulphides present are associated with the sulphur.

182,031. New Colouring Matters, Manufacture of. British Dyestuffs Corporation, Ltd., Imperial House, Kingsway, London, W.C.2, A. G. Green, H. K. Saunders, and E. B. Adams, Crumpsall Vale Chemical Works, Blackley, Manchester. Application date, August 30, 1921.

Specification 181,750 (see page 130) describes a new series of acid dyestuffs and intermediates containing the group $C_2H_4.SO_4H$ attached to nitrogen, which are obtained by the action of sulphuric acid on the corresponding oxyethyl compounds prepared by condensation of ethylene chlorhydrin with amido bodies. Other dyestuffs are obtained by using the groups $C_3H_6.SO_4H$, $C_4H_8.SO_4H$, and so on. In the present invention, a number of intermediates of this class are prepared, containing the oxyethyl, oxypropyl and oxybutyl groups, which are useful for conversion into compounds containing the group SO_4H, and are also dyestuffs in themselves. These dyestuffs possess a quinonimide structure and may have basic properties, or may contain sulphuric acid or mordant dyeing groups. The preparation is by applying the standard reactions for the preparation of oxazines, thiazines or azines to intermediates containing one or more oxyalkyl groups attached to nitrogen. Numerous examples are given.

Note.—Abstracts of the following specifications, which are now accepted, appeared in The Chemical Age when they

became open to inspection under the International Convention: —159,815 (Soc. Générale d'Evaporation Procédés Prache & Bouillon) relating to a process of crystallisation, see Vol. IV., p. 566; 163,323 (Nitrogen Corporation) relating to the preparation of hydrogen and ammonia, see Vol. V., p. 77; 165,721 (Durand & Huguenin Akt.-Ges.) relating to halogen derivatives of basic acridine dyestuffs, see Vol. V., p. 282; 169,688 (Soc. Chimique de la Grande Paroisse) relating to the preparation of aromatic aminonitro compounds, see Vol. V., p. 678.

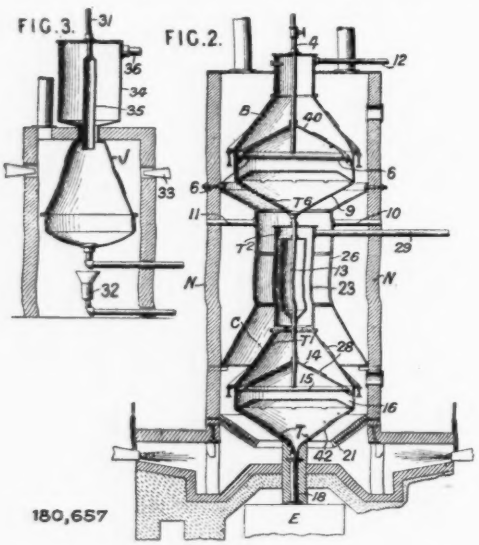
International Specifications not yet Accepted

180,625. HYDROCARBONS. M. Melamid, 9, Urachstrasse, Freiburg, Baden, Germany. International Convention date, May 25, 1921. Addition to 171,367. (See THE CHEMICAL AGE, Vol. VI., p. 48.)

Mineral oils, tar oils, and other hydrocarbons are heated under pressure with hydrogen in the presence of an alloy such as solder, or bismuth alloys, which melt at the reaction emperature (below 700° C.). Low-boiling hydrocarbons are obtained.

180,657. DISTILLING AND CRACKING HYDROCARBON OILS. E. O. Linton, 1927, Hemphill Street, Fort Worth, Tex., U.S.A. International Convention date, May 26, 1921.

The apparatus is for cracking heavy asphaltic crude or residual oils at atmospheric pressure. Oil is fed by a pipe 4 to a conical chamber 40 and passes through perforations 6 into the conical part 9 of the still B. The oil is dehydrated in this still and the vapour drawn off through a pipe 12. The



oil then passes through a pipe 13 to a plate 15 and thence to the conical part 42 of the still C. Both stills are enclosed within the furnace chamber N. Vapour rises in contact with the hot walls 28, 23 to a pipe 29, and passes thence to a condenser. Pyrometers T, T^1, T^2, T^6 are arranged at various points in the stills, and a temperature of 800–850° F. is maintained at T, 875° F. at T^1, 900–950° F. at T^2, and 350–400° F. at T^6. The residue passes out by the pipe 18. The condensed vapour from the still C passes by pipes 31, 35 to another still J heated to 500° F., and the vapour passes out through a vessel 34 and pipe 36.

180,675. METALS, EXTRACTING AND REFINING. P. Coulbeaux, 8, Avenue Constant Coquelin, Paris, and F. E. Thomas, 9, Rue Yvon Villarceaux, Paris. International Convention date, May 25, 1921.

A reducing or refining agent for use in metallurgical processes such as obtaining metals or mattes, consists of a mixture of a cyanamide such as calcium cyanamide, and peat. A gaseous reducing agent may also be used, and hydrated calcium sulphate may also be added to prevent the liberation of ammonia at a low temperature. The mixture may also be used for making electrodes for electric furnaces, for furnace linings, for dephosphorising or desiliconising iron or steel, or for chlorination or sulphuration reactions.

LATEST NOTIFICATIONS.

183,117. Process of recovering zinc from complex ores. Ellsworth, J. T. July 12, 1921.

183,123. Manufacture and production of mordant-dyeing colouring matters. Durand and Huguenin, Soc. Anon. July 15, 1921.

183,134. Process of obtaining powders of great fineness, and apparatus therefor. Podszius, E. July 12, 1921.

Specifications Accepted, with Date of Application

155,776. Effecting chemical reaction in the interior of compressors, Process for. M. Brutzkus. December 22, 1919.

156,005. Cellulose material, Manufacture of. Koln-Rottweil Akt.-Ges. December 30, 1919.

156,490. Washing gas, Apparatus for. Freyn, Brassert and Co. June 18, 1915.

159,878. Ammonia, Process for the manufacture of. Norsk Hydro-Elektrisk Kvaelstofaktieselskab. March 9, 1920.

160,811. Ammonia, Synthesis of. L'Air Liquide, Soc. Anon. pour l'Etude et l'Exploitation des Procédés G. Claude. March 30, 1920.

163,011. Separating water from coal tar, Method of and apparatus for. Bismarckhütte (Firm of). May 17, 1921.

165,083. Substantive azo-dyestuffs, Manufacture of copper compounds of. Farbenfabriken vorm. F. Bayer and Co. June 14, 1920.

172,937. Naphthalene, Process for the purification of. Barrett Co. December 15, 1920.

182,497. Resins and oil-soluble dyestuffs, Manufacture of. H. Plauson and J. A. Vielle. January 7, 1921.

182,522. Gas-making apparatus, Construction of. H. Hildick. March 23, 1921.

182,539. Magnetic separators. S. Percival. (*L. B. Woodworth, S. T. Tregaskis, Central Mining and Investment Corporation, Ltd., and Transvaal Consolidated Land and Exploration Co., Ltd.*). March 31, 1921.

182,542. Carbonising furnaces or retorts. L. H. Bonnard. March 31, 1921.

182,601. Distillation of carbonaceous materials, Apparatus for. P. M. Salerni. April 25, 1921.

182,609. Aluminium oxide, Process of reducing. L. Burgess. April 27, 1921.

182,648. Enriched water gas plant. R. Maclaurin. June 1, 1921.

182,654. Fertilisers. S. Desmond and C. A. Tisdall. June 7, 1921.

182,661. Caustic soda, Manufacture and production of. Courtaulds, Ltd., and R. O. Jones. June 11, 1921.

182,679. Electrodes, Arrangement and construction of—in apparatus for electrolising fused materials. T. Kolkin. June 27, 1921.

182,693. Lead chromate pigments, Manufacture of. H. Hetherington and W. A. Allsebrook. July 13, 1921.

182,696. Colloids and colloidal solutions, Process for preparing. Plauson's (Parent Co.), Ltd. (*Dr. H. Plauson.*) July 15, 1921.

Applications for Patents

Ashcroft, E. A. Separation and recovery of iron, silver, copper, lead, antimony, etc., from fused melts of zinc and/or lead chloride and purification of said melts for production of zinc and/or lead chloride. 19616. July 17.

Ashworth, A. Apparatus for production of bi-sulphites, etc. 19661. July 18.

Auld, S. J. M. Treatment of hydrocarbons. 19974. July 20.

Blattner, R. H. D., and Grouchkine, L. Manufacture of caustic alkali. 19615. July 17.

— and Grouchkine, L. Manufacture of caustic alkali. 20063. July 21.

Bleachers Association, Ltd. Bleaching, etc., kiers. 19541. July 17.

British Oxygen Co., Ltd., and Houseman, C. R. Manufacture of sulphur dioxide. 19820, 19821. July 19.

Burls, H. T. Treatment of carbonaceous substances. 19978. July 20.

Carbic, Ltd., and Them, H. Manufacture of calcium-carbide cakes. 20060. July 21.

Charlesworth, A. E., and Johnson, W. Machine for drying and neutralising sulphate of ammonia, etc. 19546. July 17.

Chemische Fabrik Griesheim-Elektron, and Mond, A. L. Process for production of alumina. 19700. July 18.

Deutsche Ges. für Schädlingsbekämpfung, and Jackson, J. E. Evans. Insecticides. 20026. July 21.

Farrell, E. Caustic soda recovery apparatus, etc. 20100. July 22.

Kreiss, A. L. Phosphatic fertilisers. 19747. July 18. (United States, September 13, 1921.)

Remfry, F. G. P. Treatment of hydrocarbons. 20151. July 22.

Rule, T. E. Chemical process. 19563. July 17.

Shibata, Y. Naphthalene insect-tablets. 19568. July 17.

Market Report and Current Prices

Our Market Report and Current Prices are exclusive to* THE CHEMICAL AGE, *and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.

THERE has again been a satisfactory turnover in general chemicals for home trade requirements, the prevailing tendency of prices being upwards.

Export markets have remained quiet.

General Chemicals

ACETONE has advanced strongly in price: spot supplies are very tight.

ACID ACETIC.—The turnover is substantial and prices are much firmer.

ACID CITRIC is inclined to droop, probably owing to the bad weather. There have also been considerable arrivals.

ACID FORMIC is unchanged.

ACID LACTIC has been quieter again with price unaltered.

ACID OXALIC is in better demand. A fair volume of business is reported.

ACID TARTARIC is quiet and prices are well maintained.

BARIUM CHLORIDE is practically unobtainable for early delivery; price continues to advance.

CREAM OF TARTAR.—A fair business is reported at recent levels.

IRON SULPHATE remains unchanged.

LEAD ACETATE is again higher in price and in fair demand.

LEAD NITRATE is without special feature.

LITHOPHONE.—A fair business is being done for early delivery.

POTASSIUM CARBONATE remains uninteresting.

POTASSIUM CAUSTIC.—The market is still in buyers' favour.

POTASSIUM PRUSSIATE is higher in price.

SODA ACETATE.—There is an active demand and only limited quantities are available over the remainder of the year.

SODA NITRITE.—Small business of the hand-to-mouth variety is reported; prices firm.

SODA PHOSPHATE is unchanged.

SODA PRUSSIATE remains particularly scarce and little is obtainable this side of September.

WHITE LEAD remains unchanged.

ZINC OXIDE is in good demand with little available over the next few months.

Coal Tar Intermediates

BUSINESS during the past week has been on rather better lines than previously in so far as home trade is concerned, but export markets are on the quiet side.

ALPHA NAPHTHOL is slightly easier with some home business in the market.

ALPHA NAPHTHYLAMINE is steady at last quoted figure.

ANILINE OIL is unchanged, but the salt is rather easier.

BENZIDINE BASE has been slightly more interesting on home account.

BETANAPHTHOL.—Stocks are gradually getting reduced, but this market remains at a low figure.

BETA NAPHTHYLAMINE is featureless.

CROCEINE ACID.—There is a little home business.

DIMETHYLANILINE.—Some export inquiry, but home trade is quiet.

DIPHENYLAMINE is very firm with small stocks available.

"H" ACID is rather more interesting on home account.

NAPHTHIONIC ACID is steady.

NAPHTHIONATE OF SODA.—A certain amount of home business is in the market.

NITROBENZOL is quiet and price is steady.

PARANITRANILINE.—A certain amount of home business is about.

PARAPHENYLENEDIAMINE is firm with a decent business passing.

"R" ACID has been inquired for.

RESORCIN is steady with a small home trade in the market.

Coal Tar Products

THERE is little change in this market since last week.

90's BENZOL is still worth 1s. 11d. to 2s. per gallon on rails at works.

PURE BENZOL is in poor demand, and is quoted at 2s. 4d. per gallon on rails.

CREOSOTE has a steady demand, and is fairly firm, particularly for prompt position. To-day's quotations are 5d. to 5¼d. per gallon on rails in the north, and 6d. to 6¼d. per gallon in the south.

CRESYLIC ACID is fairly steady, although there is no great fresh demand. The value is about 2s. 3d. to 2s. 4d. per gallon f.o.b. for the pale quality, 97/99%, while the dark quality 95/97% is worth about 1s. 10d. to 2s.

SOLVENT NAPHTHA is steady at about 1s. 8d.

HEAVY NAPHTHA has very little inquiry, and is quoted at 1s. 9d.

NAPHTHALENE is in poor demand, and is worth about £4 10s. to £5 10s. per ton for the crude quality, while refined is worth about £18 to £20 per ton.

PITCH.—There is a better demand for forward delivery, and prices are becoming firmer.

Sulphate of Ammonia

THE position is unchanged; buyers are beginning to show some interest in delivery during the autumn months.

Current Prices

Chemicals

	Per	£	s.	d.		£	s.	d.
Acetic anhydride	lb.	0	1	8	to	0	1	10
Acetone oil	ton	77	10	0	to	80	0	0
Acetone, pure	ton	75	0	0	to	76	0	0
Acid, Acetic, glacial, 99-100%	ton	67	0	0	to	68	0	0
Acetic, 80% pure	ton	44	0	0	to	45	0	0
Arsenic, liquid, 2000 s.g.	ton	67	0	0	to	70	0	0
Boric, cryst.	ton	60	0	0	to	65	0	0
Carbolic, cryst. 39–40%	lb.	0	0	6	to	0	0	6½
Citric	lb.	0	2	3	to	0	2	4
Formic, 80%	ton	65	0	0	to	66	0	0
Gallic, pure	lb.	0	2	11	to	0	3	0
Hydrofluoric	lb.	0	0	7½	to	0	0	8½
Lactic, 50 vol.	ton	40	0	0	to	43	0	0
Lactic, 60 vol.	ton	43	0	0	to	45	0	0
Nitric, 80 Tw.	ton	30	0	0	to	31	0	0
Oxalic	lb.	0	0	8	to	0	0	8½
Phosphoric, 1.5	ton	38	0	0	to	40	0	0
Pyrogallic, cryst.	lb	0	6	0	to	0	6	3
Salicylic, Technical	lb.	0	0	10½	to	0	1	0
Salicylic, B.P.	lb.	0	1	5	to	0	1	6
Sulphuric, 92–93%	ton	7	10	0	to	8	0	0
Tannic, commercial	lb.	0	2	3	to	0	2	9
Tartaric	lb.	0	1	5½	to	0	1	6
Alum, lump	ton	10	0	0	to	10	10	0
Alum, chrome	ton	28	0	0	to	29	0	0
Alumino ferric	ton	9	0	0	to	9	5	0
Aluminium, sulphate, 14–15%	ton	10	10	0	to	11	0	0
Aluminium, sulphate, 17–18%	ton	11	10	0	to	12	0	0
Ammonia, anhydrous	lb.	0	1	8	to	0	1	9
Ammonia, .880	ton	33	0	0	to	35	0	0
Ammonia, 920	ton	21	0	0	to	23	0	0
Ammonia, carbonate	lb.	0	0	4	to	0	0	4½
Ammonia, chloride	ton	60	0	0	to	65	0	0
Ammonia, muriate (galvanisers)	ton	35	0	0	to	37	10	0
Ammonia, nitrate (pure)	ton	35	0	0	to	40	0	0
Ammonia, phosphate	ton	74	0	0	to	75	0	0
Ammonia, sulphocyanide	lb.	0	1	10	to	0	2	0
Amyl acetate	ton	175	0	0	to	185	0	0
Arsenic, white, powdered	ton	42	0	0	to	44	0	0
Barium, carbonate, 92–94%	ton	12	10	0	to	13	0	0
Barium, Chlorate	ton	60	0	0	to	68	0	0
Barium Chloride	ton	22	10	0	to	23	0	0
Nitrate	ton	27	10	0	to	30	0	0
Sulphate, blanc fixe, dry	ton	20	10	0	to	21	0	0
Sulphate, blanc fixe, pulp	ton	10	5	0	to	10	10	0
Sulphocyanide, 95%	lb.	0	1	0	to	0	1	3
Bleaching powder, 35–37%	ton	12	0	0	to		—	
Borax crystals	ton	29	0	0	to	33	0	0
Caffein	lb.	0	13	6	to	0	14	0
Calcium acetate, Brown	ton	9	0	0	to	9	10	0
" " Grey	ton	13	10	0	to	14	0	0

	Per	£	s.	d.		£	s.	d.
Calcium Carbide	ton	16	0	0	to	17	0	0
Chloride	ton	6	10	0	to	7	0	0
Carbon bisulphide	ton	50	0	0	to	52	0	0
Casein, technical	ton	47	0	0	to	55	0	0
Cerium oxalate	lb.	0	4	6	to	0	4	9
Chromium acetate	lb.	0	1	1	to	0	1	3
Cobalt acetate	lb.	0	6	0	to	0	6	6
Oxide, black	lb.	0	9	6	to	0	10	0
Copper chloride	lb.	0	1	2	to	0	1	3
Sulphate	ton	28	10	0	to	29	0	0
Cream Tartar, 98–100%	ton	115	0	0	to	117	10	0
Epsom salts (*see* Magnesium sulphate)								
Formaldehyde, 40% vol.	ton	68	10	0	to	70	0	0
Formusol (Rongalite)	lb.	0	2	6	to	0	2	9
Glauber salts, commercial	ton	5	10	0	to	6	0	0
Glycerine, crude	ton	65	0	0	to	67	10	0
Hydrogen peroxide, 12 vols.	gal.	0	2	5	to	0	2	6
Iron perchloride	ton	30	0	0	to	32	0	0
Iron sulphate (Copperas)	ton	4	0	0	to	4	5	0
Lead acetate, white	ton	41	0	0	to	42	0	0
Carbonate (White Lead)	ton	42	0	0	to	46	0	0
Nitrate	ton	46	10	0	to	48	10	0
Litharge	ton	35	10	0	to	36	0	0
Lithopone, 30%	ton	23	10	0	to	24	0	0
Magnesium chloride	ton	10	0	0	to	10	10	0
Carbonate, light	cwt.	2	10	0	to	2	15	0
Sulphate (Epsom salts commercial)	ton	8	0	0	to	8	10	0
Sulphate (Druggists')	ton	13	10	0	to	14	10	0
Manganese, Borate, commercial	ton	65	0	0	to	75	0	0
Sulphate	ton	60	0	0	to	62	0	0
Methyl acetone	ton	60	0	0	to	65	0	0
Alcohol, 1% acetone	ton	65	10	0	to	66	0	0
Nickel sulphate, single salt	ton	49	0	0	to	51	0	0
Ammonium sulphate, double salt	ton	51	0	0	to	52	0	0
Potash, Caustic	ton	33	0	0	to	34	0	0
Potassium bichromate	lb.	0	0	6½	to		—	
Carbonate, 90%	ton	31	0	0	to	33	0	0
Chloride, 80%	ton	12	0	0	to	12	10	0
Chlorate	lb.	0	0	4½	to	0	0	5
Metabisulphite, 50–52%	ton	84	0	0	to	90	0	0
Nitrate, refined	ton	45	0	0	to	47	0	0
Permanganate	lb.	0	0	9	to	0	0	10
Prussiate, red	lb.	0	4	6	to	0	4	9
Prussiate, yellow	lb.	0	1	7	to	0	1	8
Sulphate, 90%	ton	13	0	0	to	13	10	0
Salammoniac, firsts	cwt.	3	3	0	to		—	
Seconds	cwt.	3	0	0	to		—	
Sodium acetate	ton	24	10	0	to	24	15	0
Arseniate, 45%	ton	45	0	0	to	48	0	0
Bicarbonate	ton	10	10	0	to	11	0	0
Bichromate	lb.	0	0	5½	to		—	
Bisulphite, 60–62%	ton	23	0	0	to	24	0	0
Chlorate	lb.	0	0	3¾	to	0	0	4
Caustic, 70%	ton	20	10	0	to	21	0	0
Caustic, 76%	ton	21	10	0	to	22	10	0
Hydrosulphite, powder, 85%	lb.	0	1	9	to	0	2	0
Hyposulphite, commercial	ton	13	10	0	to	14	0	0
Nitrite, 96–98%	ton	31	0	0	to	32	0	0
Phosphate, crystal	ton	18	10	0	to	19	0	0
Perborate	lb.	0	0	11	to	0	1	0
Prussiate	lb.	0	0	11½	to	0	1	0
Sulphide, crystals	ton	13	0	0	to	14	0	0
Sulphide, solid, 60–62%	ton	21	10	0	to	23	10	0
Sulphite, cryst.	ton	12	10	0	to	13	0	0
Strontium carbonate	ton	55	0	0	to	60	0	0
Strontium Nitrate	ton	50	0	0	to	55	0	0
Strontium Sulphate, white	ton	6	10	0	to	7	10	0
Sulphur chloride	ton	25	0	0	to	27	10	0
Sulphur, Flowers	ton	13	0	0	to	14	0	0
Roll	ton	13	0	0	to	14	0	0
Tartar emetic	lb.	0	1	6	to	0	1	7
Theobromine	lb.	0	14	0	to	0	14	6
Tin perchloride, 33%	lb.	0	1	2	to	0	1	4
Perchloride, solid	lb.	0	1	5	to	0	1	7
Protochloride (tin crystals)	lb.	0	1	5	to	0	1	6
Zinc chloride 102° Tw.	ton	21	0	0	to	22	10	0
Chloride, solid, 96–98%	ton	25	0	0	to	30	0	0
Oxide, 99%	ton	36	0	0	to	38	0	0
Dust, 90%	ton	45	0	0	to	47	10	0
Sulphate	ton	18	10	0	to	19	10	0

Coal Tar Intermediates, &c.

	Per	£	s.	d.		£	s.	d.
Alphanaphthol, crude	lb.	0	2	3	to	0	2	6
Alphanaphthol, refined	lb.	0	3	0	to	0	3	3
Alphanaphthylamine	lb.	0	2	0	to	0	2	1
Aniline oil, drums extra	lb.	0	1	0	to	0	1	1
Aniline salts	lb.	0	1	1	to	0	1	2
Anthracene, 40–50%	unit	0	0	8½	to	0	0	9
Benzaldehyde (free of chlorine)	lb.	0	3	9	to	0	4	3
Benzidine, base	lb.	0	5	9	to	0	6	0
Benzidine, sulphate	lb.	0	5	9	to	0	6	0
Benzoic acid	lb.	0	1	9	to	0	2	0
Benzoate of soda	lb.	0	1	7½	to	0	1	9
Benzyl chloride, technical	lb.	0	2	0	to	0	2	3
Betanaphthol benzoate	lb.	0	4	9	to	0	5	0
Betanaphthol	lb.	0	1	4	to	0	1	4½
Betanaphthylamine, technical	lb.	0	6	0	to	0	7	0
Croceine Acid, 100% basis	lb.	0	3	6	to	0	3	9
Dichlorbenzol	lb.	0	0	9	to	0	0	10
Diethylaniline	lb.	0	2	9	to	0	3	0
Dinitrobenzol	lb.	0	1	3	to	0	1	4
Dinitrochlorbenzol	lb.	0	0	11	to	0	1	0
Dinitronaphthalene	lb.	0	1	4	to	0	1	5
Dinitrotoluol	lb.	0	1	5	to	0	1	6
Dinitrophenol	lb.	0	2	9	to	0	3	0
Dimethylaniline	lb.	0	2	3	to	0	2	6
Diphenylamine	lb.	0	4	3	to	0	4	6
H-Acid	lb.	0	6	6	to	0	7	0
Metaphenylenediamine	lb.	0	5	6	to	0	5	9
Monochlorbenzol	lb.	0	0	10	to	0	1	0
Metanilic Acid	lb.	0	6	0	to	0	6	6½
Monosulphonic Acid (2.7)	lb.	0	5	6	to	0	6	0
Naphthionic acid, crude	lb.	0	3	0	to	0	3	3
Naphthionate of Soda	lb.	0	3	0	to	0	3	3
Naphthylamin-di-sulphonic-acid	lb.	0	4	0	to	0	4	3
Neville Winther Acid	lb.	0	7	9	to	0	8	0
Nitronaphthalene	lb.	0	1	4	to	0	1	5
Nitrotoluol	lb.	0	1	0	to	0	1	2
Orthoamidophenol, base	lb.	0	10	0	to	0	10	5
Orthodichlorbenzol	lb.	0	1	0	to	0	1	1
Orthotoluidine	lb.	0	1	6	to	0	1	9
Orthonitrotoluol	lb.	0	0	10	to	0	1	0
Para-amidophenol, base	lb.	0	10	0	to	0	10	6
Para-amidophenol, hydrochlor	lb.	0	10	6	to	0	11	0
Paradichlorbenzol	lb.	0	0	6	to	0	0	7
Paranitraniline	lb.	0	3	6	to	0	3	9
Paranitrophenol	lb.	0	2	3	to	0	2	6
Paranitrotoluol	lb.	0	5	0	to	0	5	3
Paraphenylenediamine, distilled	lb.	0	10	6	to	0	10	9
Paratoluidine	lb.	0	7	0	to	0	7	6
Phthalic anhydride	lb.	0	2	9	to	0	3	0
Resorcin, technical	lb.	0	5	6	to	0	6	0
Resorcin, pure	lb.	0	7	0	to	0	7	3
Salol	lb.	0	2	0	to	0	2	3
Sulphanilic acid, crude	lb.	0	1	0	to	0	1	1
Tolidine, base	lb.	0	6	6	to	0	7	0
Tolidine, mixture	lb.	0	2	6	to	0	2	9

Production of Acetyl Cellulose

MR. B. HALLETT, 75, Queen Victoria Street, London, who had been interested in the invention of acetyl cellulose and in the distillation of coal and crude oils, had a receiving order made against his estate on July 5 on the petition of a money lender, and the statutory first meeting of his creditors was held on July 20, at Bankruptcy Buildings, Carey Street, London. It appeared that when the war broke out the debtor was interested in a concession for mining quicksilver in Hungary, but it fell through, and he lost the opportunity of selling the property at a large profit. In 1915 a syndicate in which he was a substantial shareholder and a director obtained a contract with the inventor of acetyl cellulose, and although the patent had not yet been perfected, the syndicate hoped shortly to place it on the market. The debtor had provided the sum of £3,000 for experiments. The syndicate was also interested in the distillation of coal and crude oils, but in consequence of the recent financial depression, the necessary capital had not yet become available, although in the debtor's opinion there was a prospect of substantial financial support in the very near future in which even this interest would be of a value more than sufficient to pay his liabilities—which had been incurred since 1915. His unsecured liabilities roughly amounted to £10,000, of which £1,000 was due to moneylenders, £1,500 money borrowed from other sources, and £4,000 in respect of money advanced in connection with the invention, he having given his personal guarantee. His assets comprised book debts, £600; his interest in the syndicate, an agreement with another person, and another item, all of which should be of considerable value to his estate. The debtor attributed his present position to the financial depression and to heavy interest on borrowed money. The meeting was adjourned in order that the debtor might have an opportunity of submitting a proposal to his creditors.

Scottish Chemical Market

The following notes on the Scottish Chemical Market are specially supplied to THE CHEMICAL AGE *by Messrs. Charles Tennant and Co., Ltd., Glasgow, and may be accepted as representing the firm's independent and impartial opinions.*

GLASGOW, JULY 26, 1922.

BUSINESS has been rather quieter during the past week, but values generally are steady and there is no change of importance to record.

Industrial Chemicals

ACETONE.—Some good business has been done around £66 per ton c.i.f. and higher prices are looked for.

ACID ACETIC.—Moderate inquiry. Glacial 98/100 per cent. quoted £66 to £68 per ton, 80 per cent. B.P. £44 to £45 per ton, 80 per cent. technical £37 to £38 per ton.

ACID BORACIC.—Crystal or granulated, £60 per ton; powdered, £62 per ton.

ACID CITRIC (CRYSTALS, B.P.).—Offered at 2s. 4d. per lb. delivered buyers' works, in 1 cwt. kegs—free.

ACID FORMIC.—In little request. Price about £66 per ton.

ACID HYDROCHLORIC.—Makers' price unchanged. 6s. 6d. per carboy, ex works.

ACID SULPHURIC.—144°, £4 per ton; 168°, £7 5s. per ton. De-arsenicated quality £1 per ton more.

ACID TARTARIC.—Quoted 1s. 6d. per lb. delivered.

ALUM, LUMP POTASH.—Continental make quoted £15 per ton, ex store. Offered at £12 10s. c.i.f. U.K. for prompt shipment from the Continent.

ALUMINA SULPHATE.—14/15 per cent., about £8 to £9 per ton; 17/18 per cent., £10 to £11 per ton, for forward delivery.

AMMONIA CARBONATE.—Lump, 4d. per lb.; powdered, 4¼d. per lb., delivered.

AMMONIA, LIQUID, 880°.—Price about 3½d. per lb. ex works.

AMMONIA MURIATE.—Galvanisers' quality, grey, £34 to £35 per ton; fine white, £29 to £30 per ton.

AMMONIA SULPHATE.—25¼ per cent., £14 10s. per ton; 25¾ per ton, neutral, £15 3s. per ton, ex works, prompt.

ARSENIC, WHITE POWDERED.—Moderate demand. £44 to £45 per ton, ex quay.

BARIUM CARBONATE, 98/99 per cent.—Offered at £13 10s. per ton, c.i.f. U.K.

BARIUM CHLORIDE.—Price about £19 to £20 per ton, for forward delivery.

BARYTES.—Finest white English, £5 5s. per ton, ex works. Finest German on offer at £4 15s. per ton, c.i.f., U.K.

BLEACHING POWDER.—English make £13 per ton, ex station. Cheap Continental offers of £10 per ton, c.i.f., U.K.

BORAX.—Crystal or granulated, £29 per ton; powdered, £30 per ton.

CALCIUM CHLORIDE.—English make £6 10s. per ton, ex quay or station.

COPPER SULPHATE.—Moderate inquiry. £27 10s. per ton, ex quay.

COPPERAS, GREEN.—Price about £3 15s. to £4 per ton, ex works.

FORMALDEHYDE, 40 PER CENT.—Spot lots on offer at £69 to £70 per ton. Offered at £59 per ton, c.i.f. prompt shipment, from Canada.

GLAUBER SALTS.—Fine white crystals £5 per ton, ex store.

LEAD.—Red, £37 10s. per ton; white, £50 10s. per ton, delivered. Little demand for either quality.

LEAD ACETATE.—Continental offers of white crystals at £37 per ton, c.i.f. U.K., prompt shipment.

MAGNESITE.—Quoted £9 to £12 per ton, according to quality.

MAGNESIUM CHLORIDE.—Price, £7 5s. per ton; spot delivery. Continental offers of £5 15s. per ton, c.i.f. U.K.

MAGNESIUM SULPHATE (EPSOM SALTS).—Commercial quality £7 10s. per ton; B.P. quality, £9 15s. per ton, f.o.r.

NAPHTHALENE POWDER.—Small inquiry. Quoted at £20 to £20 10s. per ton, f.o.b. London, casks included.

NITRE CAKE.—Fair sales effected. Price 16s. to 18s. per ton, makers' works.

OLEUM, 65 PER CENT.—Price about £16 to £17 per ton delivered, drums returnable.

POTASSIUM BICHROMATE.—English makers' price 6¼d. per lb. delivered.

POTASSIUM CARBONATE, 90/92%.—Spot lots quoted £30 per ton, ex store.

POTASSIUM CAUSTIC, 88/92%.—£33 per ton, spot delivery. Offered at £29 per ton, c.i.f. prompt shipment from the Continent.

POTASSIUM NITRATE (SALTPETRE).—Price about £33 to £34 per ton, ex store.

POTASSIUM PRUSSIATE.—Quoted 1s. 7d. per lb., ex store.

SODIUM BICARBONATE.—Refined quality £11 per ton; mineral water quality, £10 per ton, ex quay or station.

SODIUM BICHROMATE.—English makers' price, 5d. per lb., delivered.

SODIUM CARBONATE.—Soda Crystals, £6 per ton, ex quay or station; Alkali, 58%, £9 2s. 6d. per ton, ex quay or station.

SODIUM CAUSTIC.—76/77%, £23 10s.; 70/72%, £21 10s. 60%, £24 5s.; 98/99% powdered, £27 to £28 per ton, ex station.

SODIUM HYPOSULPHITE.—Commercial quality, £13 10s. per ton; pea crystals, £19 per ton, ex store.

SODIUM NITRATE.—Quoted, £14 per ton. Refined quality, £14 5s. per ton, f.o.r. or f.o.b.

SODIUM NITRITE.—Fair inquiry. Quoted £30 per ton delivered, casks inclusive, 10/20 ton lots; 1 ton lots, £31 10s.

SODIUM SULPHATE (SALTCAKE 95%).—Quantities available for export at £4 per ton, f.o.b.

SODIUM SULPHIDE, 60/62% CONC.—Cheap Continental offers of £16 10s. per ton, c.i.f. U.K.

SULPHUR.—Government surplus stocks of Sicilian thirds still available. Price £4 5s. to £4 15s. per ton, according to quantity. Roll, £13; rock £12; ground £12; flowers £14 per ton. Moderate inquiry for flowers.

SULPHUR MONO CHLORIDE.—Offered at £26 per ton net, drums free.

ZINC DUST.—Offered at £30 per ton ex store, Manchester.

ZINC OXIDE.—Offered at £34 per ton, c.i.f. U.K. prompt shipment from the Continent.

NOTE.—The above prices are for bulk business and are not to be taken as applicable to small parcels.

Coal Tar Intermediates and Wood Distillation Products

BENZOL, CRUDE.—Prices still inclined to fall; market weak.

BINITROTOLUOL.—Some inquiry. Price quoted, 1s. 5d. per lb. delivered, casks free.

DIMETHYLAMINE, CRUDE.—Offered at 3s. 9d. per lb. delivered, 100% basis, packages extra; returnable.

DIMETHYLANILINE.—Orders being booked at 2s. 6d. per lb. delivered, in returnable drums. Market firm.

"H" ACID.—Several inquiries. Still firm at price last quoted.

METHYL ALCOHOL, PURE, 99½/100%.—Now offered at £66 per ton, c.i.f. U.K. port.

MONO ETHYL ORTHO TOLUIDINE.—Some inquiry. Price 8s. 2d. per lb. delivered, packages extra.

NAPHTHIONATE OF SODA.—Some inquiry. Quoted at 2s. 10d. per lb. delivered, packages free, 100% basis.

PHTHALIC ANHYDRIDE.—Several inquiries. Offered at 2s. 6d. per lb. delivered, f.o.b., packages free.

Recent Wills

Mr. Edward Hawes Dore, The Bungalow, Oakwood Avenue, Purley, a director of the United Yeast Co., Bristol, and of the Distillers Co., Ltd..... £12,873

Mr. Edward Vaughan Morgan, Harrington Gardens, South Kensington, proprietor of the *Chemist and Druggist*, and a director of the Morgan Crucible Co..... £315,831

German Chemical Trade Notes

FROM OUR OWN CORRESPONDENT.

Berlin, July 24, 1922.

THE main feature of the chemical market during the past week has been speculation. While foreign funds maintained their high standard, offerings were scarce and at rising prices. The sudden improvement of the mark resulted in a panic among speculators, and during this short period offerings were urgently made and even lower bids were sometimes accepted. From the middle of the week foreign currencies rose again and consequently most of the goods are off the market. It is reported that, although factories are filled up with orders from abroad, the inland consumption is declining owing to the diminished buying-power of all German consumers; the main factor, however, is the acute shortage of raw materials and fuel.

Tar products are firm, and a well-maintained demand prevails. Prices vary so widely from day to day that the following quotations can only be taken as average prices.

The following quotations are given in marks per kilogram (d.=domestic price; e.=export price):—

ACIDS: Boric is worth 124 mk. d.; 128 mk. e. Citric, loose, 475 mk. d. and e. Formic meeting with interest at 39 mk. d.; supplies scarce. Oxalic, 98/100%, 50 mk. d.; 95 mk. e. Tartaric, offerings exceedingly scarce; buyers are granting every price called for; A.1. quality to-day is quoted at 290/310 mk. d.; 320/325 mk. e.

INDUSTRIAL CHEMICALS: Alum, Potash, crystal powder, 12.75 mk. d.; 15 mk. e.; lumps advanced to 16.50 mk. d.; 23 mk. e. Alumina Sulphate, 14/15%, 15 mk. e.; 17/18%, 18 mk. e. Ammonia Carbonate, hardly obtainable; on spot it is worth 26 mk. d.; 44 mk. e. Barium Chloride, 25 mk. d.; 35 mk. e. Bleaching Powder, 110/115°, 9.50 mk. d.; 17 mk. e. Borax, crystallised was quoted at 61 mk. d. and 63 mk. e. Calcium Chloride, 70/75%, 8 mk. d.; 9.50 mk. e. Chrome Alum, 15%, 38 mk. d.; 60 mk. e. Copper Sulphate, 98/100%, 51/58 mk. d. Epsom Salt, crystallised, 4.50 mk. d.; 6.25 mk. e. Formaldehyde, 40%, 105 mk. d.; 110 mk. e. Glauber's Salt, technical crystallised, 2.80/5 mk. d.; 5/6 mk. e. Glycerin—considerable orders were placed at 110/125 mk. d. and 125/155 mk. e. Lead, Red, 66 mk. d.; 72/73 mk. e. Lead, White, 67 mk. d.; 71/73 mk. e. Litharge, crystallised, 68 mk. d.; 75 mk. e. Lithopone, red-seal, 27.50 mk. d. Magnesium Chloride, 3.75 mk. d.; 8.25 mk. e. Potash Carbonate, 96/98%, 37.50 mk. d.; 65 mk. e. Potash Caustic, 88/92%, obtainable at 33/38 mk. d.; 56 mk. e., but only in small parcels. It is expected that this article will reach a record price within a short time owing to the recent increases by the Potash Syndicate. Potash Caustic, liquor, 15 mk. d. Potash Chlorate, 40/49 mk. d.; 52/55 mk. e. Potash Bichromate, 80/82 mk. d.; 110/135 mk. e. Potash Permanganate, 110 mk. d.; 125 mk. e. Potash Saltpetre, 34.50 mk. d. Salt Cake, 6.25 mk. d.; 7.75/9 mk. e. Salol, 260 mk. d.; 320 mk. e. Soda Ash offered freely at 15/16.75 mk. d.; 15 mk. e. Soda, Caustic, 125/128°, was one of the most favoured products, and advanced to 38.50 mk. d. and 37 mk. e.; liquor, 38/40°, 14 mk. d. Soda Crystals were in request at 9 mk. d.; 13 mk. e. Soda Hyposulphite, pea form, 17/18.50 mk. d.; 21/23 mk. e.; crystallised, 13 mk. d.; 18 mk. e. Soda Saltpetre, technical, 24.50 mk. d. Soda Silicate, 38/40°, 4.50/8 mk. d.; 6.50/10 mk. e. Soda Sulphide, 60/62%, was in brisk demand at 26 mk. d. and 32/33 mk. e.; 30/32%, 12 mk. d.; 15 mk. e. Zinc Chloride, 27.50 mk. d.; 33 mk. e. Zinc, White, red seal, 62/65 mk. d.; 65/75 mk. e.; green seal, 65 mk. d.; 68 mk. e.

TAR PRODUCTS: Toluol, purified, 43.25 mk. d. Solvent-Benzol, purified, I., 36.75 mk. d.; II., 33.25 mk. d. Betanaphthol was held at 120 mk. e. Carbolineum, in good demand; pure oil goods, 7.50/8 mk. d. ex factory. Naphthalene met with improved export business at 32/37 mk. Tetralin is quoted at 21.40 mk. d. Dekalin, 29 mk. p. kg. in tank car lots free on German railway station.

The Nitrate Market

REPORTING on the market for nitrate of soda, under date of July 19, Aikman (London), Ltd., state that since July 6 the arrivals amount to only about 2,000 tons, and about 1,000 tons are due during the next fortnight.

The market, the report continues, has ruled rather quieter during the last fortnight, and the violent fluctuations in the different Continental exchanges have made business very difficult. Pool sales during that period have amounted to about 30,000 tons. Quotations on the Continent in sterling are about £12 for July delivery, £11 15s. September-October, and £12 5s. to £12 10s. per ton for spring delivery. In f.o.b. the Producers' Association have made further sales for August delivery, and their total now reaches about 300,000 tons. The inland price in Germany for synthetic nitrate of soda has again been raised from 65.60m. to 86.90m. per unit of nitrogen per 100 kilos, and for sulphate of ammonia from 54.50m. to 72.20m. per unit.

The shipment figures for the first fortnight of July (in tons) are to-day cabled as follows: To Europe and Egypt, 28,000, against 11,000 in 1920 and 36,000 in 1913; to United States, 22,000, against 9,000 in 1921, 10,000 in 1920, and 18,000 in 1913; to Japan and other countries, 18,000, against 3,000 in 1921, and 7,000 in 1913. In quotas, considerable transactions are reported at 1s., 1s. 1d., and 1s. 1½d. per quintal, closing with buyers thereat.

The sulphate of ammonia market rules quiet, but firm, with prices unchanged.

War-time Manufacture of T.N.T.

Chemists' Claim to be Considered

ON Monday the Royal Commission on Awards to Inventors continued the hearing of the claims of Lieut.-Col. Craig, Sir R. Robertson, Dr. R. C. Farmer, and Dr. G. Rotter in respect of the manufacture of T.N.T. (see THE CHEMICAL AGE, Vol VII., pp. 62 and 82). The case for the claimants having been closed, the Attorney-General (Sir Ernest Pollock) for the Treasury, said these claims ought to fail by reason of the status occupied by the claimants. There had been no cases, he contended, in which persons holding analogous positions to the claimants had been rewarded by the Commission, and rewarded for inventions *per se*. Here they had men who were employed in the Research Department for the purpose of research. The very purpose of the Research Department was that those who worked in it could be given a problem to solve, and they solved it by reason of the equipment with which they were provided. The claimants had not only accretions of salary, but were given advances which clearly showed appreciation of the responsible work with which they were charged.

Dr. M. O. Forster described the work carried out by the claimants as ordinary laboratory routine. He must say the application of the process for the manufacture of T.N.T. by the claimants was most ingenious, but it was the application of one of the commonest processes known to the organic chemist. Cross-examined by Mr. Hunter Gray, witness said that the claimants increased the yield of T.N.T. very considerably on what was produced in 1914.

Dr. W. R. Hodgkinson, formerly Professor of Chemistry at the Royal Ordnance College, said that the standard explosive used by the Government before 1914 was lyddite, and T.N.T. had scarcely begun to be used or only experimentally.

Dr. S. Levy spoke to visiting all the factories making T.N.T. early in the war, and to the processes of manufacture being similar at each. To the best of his knowledge T.N.T. was not made at any national factory without oleum. Answering Mr. Hunter Gray, the witness said that 85 to 95 per cent. was a common yield of T.N.T. at the national factories. Further cross-examined, witness said he thought the claimants carried out some very valuable work, but they simply adapted existing knowledge, which enabled them to carry on production without more experimental work.

"Mere Research Work"

Mr. R. Whitehead (for the Treasury) said the real substance of the case was whether the claimants did such quality work as to bring them within the brilliancy and utility clause of the report. They did not give birth to the idea that T.N.T. could not be made without oleum, and they did not use any material other than had been used before they started their work. They really worked out the best temperatures to get the best yield, and it was mere research work which did not merit reward.

Mr. Hunter Gray submitted that the work of the claimants was of a brilliancy and utility which merited the special bounty of the Crown, and that the case was of value and of great importance. He contended that the claimants solved the problems of quantity and time by a series of experiments which had been dismissed as ordinary research work. It was unheard of before to make T.N.T. in 12 hours, and he submitted that but for the good fortune of this country having these gentlemen the yield of T.N.T. would have been a third of the rate.

The Chairman intimated that they would consider their award. He added that the Commission would not sit again before October.

Company News

LINOLEUM MANUFACTURING CO., LTD.—An interim dividend of 5s. per share, free of tax, is payable on September 15.

INTERNATIONAL NICKEL.—A quarterly dividend of 1¾ per cent. on the preferred stock is payable on August 1, to stockholders of record at the close of business on July 20.

WELSBACH LIGHT CO., LTD.—The directors have decided to recommend a dividend of 5 per cent., less tax, for the year ended March 31 last. The transfer books are closed until August 8.

BRITISH OIL AND CAKE MILLS, LTD.—The directors have decided to pay an interim dividend on the ordinary shares of 5 per cent., less tax, for the current year. The share register will be closed from August 18 to September 2 inclusive, and warrants will be posted on or about September 2 next.

ANTON JURGENS UNITED (MARGARINE) WORKS.—The directors have decided to postpone the payment of the interim dividend on the 6 per cent. cumulative participating "B" preference shares for the half-year ended June 30 last. This decision does not affect the dividend on the 7 per cent. cumulative participating preference shares of Jurgens, Ltd. (the English company), which will be paid on August 1.

HADFELDS, LTD.—It is reported that the debenture holders have been notified that in consequence of the great fall in money values the directors propose paying off the existing debenture stock and to issue new stock at lower interest. The present debenture stock is of 7½ per cent.; it was issued to the amount of £1,000,000 in November, 1920, at 98, the company reserving the right to repay on any interest date on six months previous notice at 102 per cent. It is proposed to issue new 5½ per cent. stock, limited to £1,040,000, at 98¼. Holders of old stock will be able to exchange at the rate of £104 new stock for each £100 old stock. An interim dividend of 6d. per share, free of tax, on the ordinary shares is payable on August 21.

LIBIOLA COPPER MINING CO.—The accounts for 1921 show a credit balance of £2,321, from which must be deducted the debit forward in 1920 of £1,024, leaving a net credit balance of £1,297 to be carried forward. The production for the year was 4,080 tons copper ore and 5,405 tons pyrites. The reserves at December 31, 1921, were 6,045 tons copper ore and 33,910 tons pyrites, showing a slight decrease. The market for the pyrites containing low-grade copper was maintained, and the production of that class of ore was increased accordingly. Taxation in Italy increases alarmingly, and the disbursements under this heading, coupled with exchange, destroyed all prospects of the payment of a dividend, which the board at one time hoped would have been possible. The annual meeting will be held at Winchester House, London, on July 21, at noon.

VIRGINIA CAROLINA CHEMICAL CO.—Cabled advices from New York state that a syndicate, headed by Blair and Co. Inc., Hallgarten and Co., Equitable Trust Co. and Chase Securities Corporation, has announced that the issue of $12,500,000 Virginia Carolina Chemical Co. fifteen-year 7½ per cent. convertible sinking fund gold bonds has been oversubscribed. The lists opened on Monday, and the bonds, which are due on July 1, 1937, were offered at 98 and interest, yielding about 7·73 per cent. This issue was made in pursuance of the plan whereunder all the company's funded indebtedness is to be retired and the debt consolidated in these $12,500,000 bonds and $25,000,000 first mortgage bonds recently sold by the same bankers. The new bonds are convertible during their life into new, no par value, voting shares of common stock at $35 per share.

ANGLO-CONTINENTAL GUANO WORKS.—The report for 1921 states that a settlement has been arrived at with the Inland Revenue concerning the company's claim under the Finance Act, 1921, in respect of fall in stock values. Taking the total amount to be recovered into account, the net profit, after providing for all trade charges, directors' fees, and income tax, amounts to £32,363, plus £9,666 brought forward, making £42,030. As previously announced, the directors recommend a dividend on the ordinary shares of 5 per cent. for the year, less tax, carrying forward £5,530. A further claim has been put forward by the company under another section of Finance Act, and is still under consideration by the Inland Revenue. No estimate is to-day possible of the result of this claim, which has therefore been left entirely out of account. The annual meeting was held on Wednesday at the Great Eastern Hotel, London.

MINERALS SEPARATION, LTD.—The expenditure during 1921 exceeded the revenue by £24,000; this is largely accounted for by the continued depression in the base metal industry, entailing a large decrease in the output of metal by licensees and consequent loss of royalties to the company. The company's business in Spain is making steady progress, and has become self-supporting. Research work in connection with the company's coal processes has been continued intermittently, with the result that further important improvements have been evolved which have greatly contributed to the unqualified success obtained in the large scale trials of the new briquetting system. In view of the success achieved in these trials, the long-term agreement between the Powell-Duffryn Co. and the Minerals Separation has been definitely signed. Thorough investigation is still being carried on with regard to the treatment of gold ores by the company's processes in London and in South Africa. A new plant to treat 250 tons of gold ore a day is now in course of being installed in the Transvaal. The annual meeting was held on Friday at Winchester House, London.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

LOCALITY OF FIRM OR AGENT.	MATERIAL.	REF. NO.
Basle	Turpentine, linseed oil ..	111
New Zealand..	Sulphide of soda, cream of tartar, tartaric and citric acids, and drugs..	89
Copenhagen ..	Heavy chemicals	94

Tariff Changes

UNION OF SOUTH AFRICA.—Imported goods offered for sale in the Union at less than the wholesale price in the country of manufacture, added to all charges including freight to port of entry, will be subject to a special Customs duty equal to the difference between the two prices.

BARBADOS.—Increased Customs duties which have recently come into force state that the British preferential tariff on cotton seed to be used for expressing oil therefrom is now 7s. 6d. per ton, while the general tariff is fixed at 15s. per ton. An additional duty is levied at the rate of one-fifth of the present duties payable on all articles liable to Customs duty, except edible oils and seeds for oil expressing.

British Cyanides

THE ordinary general meeting of the British Cyanides Co., Ltd., was held at the Cannon Street Hotel on Wednesday. Mr. C. F. Rowsell (chairman) said that having regard to the very exceptional times through which they had been passing, the results placed before them were not unsatisfactory, but in a company like the British Cyanides Co., it was the future rather than the past which would interest the shareholders most, and, after all, they started the present financial year with still £50,000 in reserve and a substantial margin of liquid assets over their liabilities. With the new financial year, they started not only to meet the whole of their charges, but to commence to earn profits for the business. He saw every reason to believe that they had arrived at the turning point, and that ere long an era of prosperity for industrial enterprises would set in. The increasing credit of the British Government was undoubtedly a very favourable symptom, because it indicated that the financial world was beginning to look more towards stability. He believed they might look for a prosperous future for their country.

Catalogues Received

J. H. Holmes & Co.—From Portland Road, Newcastle-on-Tyne, this firm is distributing a new catalogue of alternating current, induction type, motors. It contains, in addition to descriptions and illustrations of various types of motors, a section of general notes giving a mass of useful information. Although it is sometimes thought to be impracticable to state full load currents, an appropriate table of their values is included. The tables of outputs contained in the body of the catalogue are unusually comprehensive.

National Lime Association.—A series of pamphlets dealing with the various uses of lime has been issued by this Association from 918, G. Street, N.W., Washington, D.C. In one of the pamphlets an outline is given of the process of lime manufacture, and a flow sheet adds to its interest. Other booklets deal with the use of lime in the varnish and textile industries respectively, the distribution of lime by tonnage in chemical industry, and its chemical, agricultural and constructional uses. A very detailed chart illustrates the latter.

Meldrums, Ltd.—Additional pages for their recently issued forced-draught furnace catalogue have been issued by this firm from Timperley, near Manchester. The sheets show Meldrum furnaces as installed in a number of industries, and include illustrations of a "Meldrum" furnace on a Cornish boiler at the chemical works of the Polysulphin Co., Bristol, and furnaces on a Lancashire boiler at the match factory of S. J. Moreland and Sons, Gloucester. "Meldrum" furnaces on a battery of 19 Lancashire boilers at a Scottish chemical works are also shown.

W. H. A. Robertson and Co., Ltd.—Air compressors, vacuum pumps, desiccating sets, etc., are dealt with in a catalogue recently issued by this company from Lynton Works, Bedford. Some of the uses of compressed air are discussed, and the catalogue is intended to represent types of compressors suited for all purposes. One of the main features in these compressors is a patented valve arrangement which permits both suction and delivery valves being withdrawn simultaneously. The clearance with this arrangement is said to be extremely small.

Unit Reinforcement Construction Co., Ltd.—A handsomely printed booklet (No. 3) has just been published dealing with reinforced concrete design and construction. The desirability of having the constructional work carried out by the designers is indicated, and among other features dealt with are hollow tile floors, with and without pre-cast ribs, and flat slab construction. Tables are given of maximum spans for various overloads and a number of other useful memoranda, sectional views, and illustrations of works executed. Copies of the booklet are obtainable on application to the company's offices at Stockport Road, Manchester.

Clayton and Shuttleworth, Ltd.—In their latest catalogue on "Water Tube Boilers" the company point out that the effect of the "Clayton" designs is to allow of a large increase of safe evaporative capacity in terms of heating surface, and at the same time provide a larger margin of safety and durability. A brief review is given of water tube boiler practice, in which the questions of boiler efficiency, the relations between boiler duty and space occupied, etc., are concisely dealt with. The advantages claimed for the Clayton patented sectional boiler and the Clayton patented curved tube drum boiler are set forth with the aid of sectional diagrams and other illustrations. Copies are obtainable from the company's offices at Lincoln.

Automatic and Electric Furnaces, Ltd.—From 281–3, Gray's Inn Road, London, this company is issuing a new catalogue on Wild-Barfield automatic electric hardening equipment. The problems of heat treatment and their solution by the use of electricity are explained, and particular emphasis is laid on the cheapness and the efficiency of hardening steel at the non-magnetic point. The pyroscopic detector in theory and in practice is dealt with at some length, and is accompanied by graphs and diagrams. Other apparatus referred to includes vertical radiation and horizontal "flat" furnaces, excess temperature cut-outs, oil and salt tempering baths, air tempering muffles, maturing ovens, pyrometers, and a patented magnetic sclerometer.

Pott, Cassels and Williamson.—"A Record Installation of Centrifugals" is the title of a booklet sent out from Motherwell, Scotland, by this firm. This record installation, which was made for an East Indian sugar refinery, consists of no fewer than 75 electrically driven units, arranged in two double rows, batteries of 42 and 33 machines respectively, the baskets being of steel, and 36 in. in diameter by 18 in. deep. Each centrifugal is driven by a separate electric motor through a special form of friction clutch, which also acts as a flexible coupling between the motor and centrifugal. A special feature of the machines is the method of suspension, which consists of the firm's steel solid spindle with a combination of ball and sleeve bearings and self-adjusting rubber buffers.

Kelvin, Bottomley and Baird, Ltd.—Bulletin J. 107, descriptive of the "Pneumercator" tank gauge is issued by this company from 18, Cambridge Street, Glasgow. Its employment for measuring and weighing oil fuel and all liquids is indicated, and the advantages of this system are compared with the disadvantages of the old method of using dipping rods or tapes. It is claimed for these gauges that they are self-checking and foolproof, that the reading may be taken at any distance from the tank or tanks, and that the condition of the tanks and the total amount of liquid stock are always in sight at the observing position. It is also stated that the gauge can be used in connection with tanks of any shape or size, elevated, sunk in the ground or placed in inaccessible positions.

A. Gallenkamp and Co., Ltd.—List No. 79, relating to calorimeters for solid, liquid and gaseous fuels, is now being circulated by this firm from 19–21, Sun Street, Finsbury Square, London. It contains concise particulars and illustrations of a number of calorimeters, together with useful information on their employment. Detailed instructions for using Darling's oxygen combustion fuel calorimeter are given, together with sectional drawings of the various types made. Other types of calorimeter include Dr. Lewis Thompson's, William Thomson's and Rosenhain's, and Parr's. Apparatus of the sodium peroxide type is represented by the Roland Wild calorimeter, while the Berthelot-Mahler bomb type, with modified bomb by Dr. K. Kroeker, is also shown. Illustrations are given of Boy's and Junker's gas calorimeters and the Sheffield pattern Simmance total heat gas calorimeter.

Rees Roturbo Manufacturing Co., Ltd.—Pamphlets R. 191 and R. 197, descriptive of their turbine pumps and rotary jet condensers and air pumps, are being sent out by this company, whose works are at Wolverhampton. In the former sectional drawings and graphs illustrate the construction and performance of the Rees Roturbo turbine pump, the distinguishing feature of which is the construction of the impeller, which takes the form of a large capacity drum or pressure chamber, instead of the ordinary flat disc runner or impeller. The object of this design is to obtain by centrifugal force inside the pressure drum a constant hydraulic pressure equivalent to the height of the working lift. The booklet on rotary jet condensers and vacuum pumps contains detailed descriptions, with illustrations, of various types of machine.

Skefco Ball Bearing Co., Ltd.—In view of the general interest which is now being taken in regard to economical power consumption this firm's handsomely-produced 64-page booklet on "Transmission Accessories" will no doubt be read with interest. It points out that although ball bearings of the ordinary single-row rigid type are superior to the ring-oiled bearings, the balls are liable to be crushed by use of the devices normally employed for counteracting shaft deflections. The "SKF" self-aligning bearings, it is stated, render special swivelling housings unnecessary, as, owing to their patented spherical design, the bearings themselves deal instantly and automatically through the rolling of the balls with any slight deflection of the shafting. Other special features claimed for these bearings are the double row of balls, so arranged that the bulk of the load at any given moment is carried by three balls against the usual one only, and their ability to withstand end thrust without loss of efficiency, due to the fact that the plane of rotation of each row of balls is conical. A great deal of information is given regarding the erection of transmission gear, and the booklet is copiously illustrated. An interesting feature is the novel method of reproducing blue prints.

Tehidy Minerals

An Improvement in the China Clay Trade

SECONDING the adoption of the accounts at the second annual general meeting of Tehidy Minerals, held on July 21 at Carn Brea, Cornwall, Mr. C. A. Moreing said the company's mineral resources were extensive and varied. He sketched the misfortunes which had befallen East Pool and South Crofty, and said both these companies had tackled the position energetically. East Pool's new shaft had been sunk at an average rate of 110 ft. per month. A fissure was encountered in that shaft giving about 1,800 gallons of water per hour. Experts of the Francois Cementation Process were dealing with this, and it was expected in a few days this would be sealed off and sinking continued under dry conditions.

With a loan of £30,000 from the Government, South Crofty had installed a 90-in. Cornish pump, and hoped to resume operations at the end of the year. These facts indicated that the people directly concerned with Cornish mining were convinced there was life in the tin-mining industry yet.

With resumption of work at South Crofty, the tin streams would also restart. Referring to the improvement in the china clay trace, Mr. Moreing said it was gratifying to know that the volume of trade this year had been about 60 per cent. of the pre-war figure. That was already being reflected in an appreciable increase of dues from the several larger operating companies which were tenants of Tehidy Minerals, Ltd., and in increased revenue to the works they owned at Halviggan and those at Glnn Valley, owned by the Cornish Kaolin, Ltd., in which Tehidy Minerals were largely interested.

The Halviggan property, as the result of the year's operat.ons, was an asset of much increased value. A complete overhaul had been made in the pit, which had resulted in considerable reduction of working costs, and improvements in the refining section had appreciated the value of their products by nearly 10s. per ton. Thus, with lower working costs and high prices, profits had proportionately increased, and, at the present moment, the monthly profit was approaching £2,000. A larger amount of development work had been done, which had greatly increased their reserves of highest grade products during the year.

The Kaolin Co. had entirely remodelled its plant, with most satisfactory results. Sales in recent months had been steadily increasing, and were well up to, if not ahead of, present output. An exhaustive survey had recently been made of their untouched clay-bearing lands, and efforts had been concentrated on a large area at Menniridden. Pitting operations were in hand. The quality of the clay had surpassed all their anticipations.

Acid-proof Clothing for Chemists

NOT the least of the chemist's misfortunes has been the havoc wrought by acids upon his clothing, and the announcement that an acid and waterproof material has been placed upon the market will be received with interest. About four months ago Messrs. T. W. Storey and Morris, of Victoria Buildings, Manchester, introduced a new acid-proof cloth which was claimed to be superior to anything yet produced. Further research has, however, resulted in the production of a further improved material, known as "Aswapruf," which is now available for coats, overalls, aprons, leggings, &c. The material is made in a thin and thick quality and is made up by the manufacturers into suitable garments. A representa- of THE CHEMICAL AGE was shown the effect of various acids on the material. Concentrated sulphuric acid produced a stain, but the fibre was not affected, while ordinary sulphuric acid, hydrochloric, and nitric acids and 40 per cent. caustic soda did not affect the material in any way. The manufacturers intimated that they had already received a number of unsolicited testimonials from users in the United Kingdom and the Colonies.

Mixed Coal and Coke as Water-Gas Generator Fuel

MR. W. J. DUNKLEY, gas engineer of the Bureau of Mines, has been conducting tests at Ottawa, Illinois, on the use of mixtures of Illinois bituminous coal and retort-house coke as water-gas generator fuel in a six-foot water gas set operating ten hours per day. The work is in co-operation with the American Gas Association.

London and North Western Dock Facilities

IN addition to the dock facilities indicated in THE CHEMICAL AGE recently, the organisation of the London and North-Western Railway is worthy of notice. On the East Coast they have Goole Docks, which are fifty miles from the open sea, thus giving favourable railway rates with the great manufacturing districts of Yorkshire, Lancashire, and the Midlands. Merchandise passes direct from, or to, the steamer and railway wagon, avoiding the expensive items of cartage and handling. Goole has made rapid progress during recent years, due to its unique geographical situation and modern equipment.

Garston Docks, a railway port on the Mersey, has eight miles of sidings alongside the quays, thus again cutting handling and cartage out of the cost of transport. Vessels can enter and leave the docks two or three hours before or after high water, and there is a large range of sheds and warehouses, and accommodation of all kinds. Then there is Ellesmere Port, nine miles from Liverpool on the Manchester Ship Canal, also connected with the Shropshire Union Canal, which waterway serves Birmingham, Staffordshire and Worcestershire districts. By barge, rail or ship Ellesmere is on the way to everywhere, and industry is finding this out, and the already large accommodation is being extended. There is storage capacity for 44,000 tons of general merchandise, and the growing traffic in oil has necessitated the construction of large storage tanks.

Fleetwood, the premier fishing port of the West Coast, at Wyre Dock takes general merchandise, and offers numerous advantages. Loading is from ship to wagon, and *vice versa*, with shed accommodation alongside the quay for cement, wood pulp, esparto grass, and general merchandise. Stevedore and storage charges are low, and there are no dues on cargoes forwarded or received by rail. Manchester Docks have two direct connections with the L. and N.W. Railway, who run express goods trains to all industrial centres and, in addition, have four goods depots, with warehouses in Manchester, vast in size and mechanically equipped to a high degree of perfection. Liverpool docks are connected with the L. and N.W. Railway at eight separate and distinct points, whose siding accommodation covers 234 acres, includes 78 miles of line, and accommodates 8,200 wagons. Express goods trains are run via the L. and N.W. trunk line to all parts of the country. Birkenhead, the daughter port of Liverpool, is closely connected with the L. and N.W. Railway, and the traffic in and out of Birkenhead to all parts of the world is one of the Company's manifold responsibilities.

Business Men and War

SIR ERNEST J. P. BENN, Sir Ernest Birch, Sir Charles W. Macara, and Mr. B. Seebohm Rowntree are among the directors of well-known companies who sign the following letter to the press :—It is proposed to make the week-end preceding the anniversary of the outbreak of the war an occasion for expressing the desire of civilised people that there shall be no more war. There is no section of the public who wish for an end of armed hostilities more than manufacturers and business men. The view is sometimes put forward that war benefits trade, but the exact opposite is the truth. Of this the present condition of industry in this country and abroad is sufficient indication. We therefore wish to associate ourselves, as employers of labour and commercial men, with the proposal to which we have referred, and hope that the demonstrations which are being organised throughout Europe and America will have a substantial effect in developing international goodwill between the peoples, and in strengthening thos policies which make for a permanent peace.

Vacuum Problems

A TREATISE on vacua ("Vacuum," by Henry A. Fleuss. Publishers: Poynder and Son, Holybrook Press, Reading. Price 6d.) has just been published by Mr. Henry A. Fleuss, the pioneer of fine mechanical vacuum pumps, and the inventor of the "Geryk" air pumps, which are manufactured by the Pulsometer Engineering Co., Ltd., of Reading and London. This booklet contains much valuable information respecting vacuum work, and will be of considerable interest to anyone having vacuum problems to deal with.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

County Court Judgments

[NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.

BEVAN, M. L., Woodfield Street, Morriston, Swansea, chemist, £12 16s. 8d., June 2; and £10 4s., June 3.

BIRKETT, William, 519, Barking Road, Plaistow, chemist. £12 8s. 5d. May 31.

FENNELL, R. E., 42, Cloudesley Road, Islington, chemist, £36 6s. May 25.

HACKFORD, —., 37, Mecklenburgh Square, W.C., chemist, £39 8s. 10d. May 29.

HARCOURT, D. G., Harcourt's Cash Drug Stores, 44A, Rusholme Road, Manchester, chemist, £13 17s. 6d. June 2.

HILL BROTHERS, Acme Works, Button Lane, Sheffield, polish manufacturers, £29 17s. 1d. May 25.

JAMES, Evan William, 46, Oxford Street, Mountain Ash, chemist, £27 17s. 5d. May 16.

LLEWELLYN, W., 135, Dunraven Street, Tonypandy, chemist, £23 2s. 2d. May 11.

MacDIARMID AND CO., 82, Mark Lane, E.C., chemical merchants, £13 6s. 6d. May 26.

McCOLGAN, W. D., 35, Hide Hill, Berwick-on-Tweed, chemist, £16 15s. 2d. May 29.

MERRY, E. Lee, 24, Old Bond Street, W., chemist, £11 14s. 4d. May 29.

NASH (F. J.), LTD., Cambrian Works, Newtown, chemists, £11 13s. 3d. May 24.

OLD FORD WORKS, 361, Old Ford Road, glass bottle makers, £10 16s. 4d. May 4.

STEVEN —, (widow), 19, Liverpool Road, Stoke-on-Trent, chemist, £20 3s. 7d. May 31.

Mortgages and Charges

*[NOTE.—The Companies Consolidation Act, of 1908, provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*

ALLEN-LIVERSIDGE, LTD., London, S.W., acetylene manufacturers.—Registered July 11, charge (supplemental to Trust Deed registered February 24, 1922, securing £100,000 1st debenture stock); charged on land in Helen Street, Govan. *£50,000. January 12, 1922.

FRESSONS DRUG STORES, LTD., London, N.W.—Registered July 12, charge securing all moneys due or to become due to bank; charged on 177, Cricklewood Broadway, N.W.

HEADLAND AND CO. (1912), LTD., Brighton, chemists.—Registered July 12, £1,000 debenture, to G. H. Strutt, 238, Highfield Road, Birmingham, chemists' traveller; general charge. *£260. December 31, 1921.

ODCLON, LTD., London, N.W., perfumery manufacturers.—Registered July 13, £250 debenture; general charge. *Nil. March 11, 1921.

UNITED GLASS BOTTLE MANUFACTURERS, LTD., London, W.C.—Registered June 19, charge under Land Transfer Acts (supplemental to Trust Deed registered August 8, 1921, securing £600,000 1st debenture stock); charged on lands in Charlton, Kidbrooke, Greenwich and Lewisham. *£377,556. April 14, 1921.

WADSWORTH LEES AND CO., LTD., Huddersfield, dyers, etc.—Registered June 29, £1,747 10s. and £4,952 10s. mortgages; charged on Leymoor Dyeworks, Newhouse, Golcar, and other property adjoining. *Nil. August 26, 1921.

Satisfaction

BARRETT (R. H.), LTD., London, E., glass bottle manufacturers.—Satisfaction registered July 17, £1,500, registered February 12, 1914.

Bill of Sale

MOTTERSHEAD, Thomas Henry, 80, Tootal Drive, Weaste, chemical merchant. July 18. £70.

London Gazette

Bankruptcy Information

JAMES, Evan William, 56 and 58, Oxford Street, Mountain Ash, and 33, Rheola Street, Penrhiwceiber, co. Glamorgan, dispensing chemist and druggist. First meeting, August 2, 11.30 a.m., Official Receiver's Office, 34, Park Place, Cardiff. Public examination, August 25, 10.30 a.m., Temperance Hall, Aberdare.

SEDDON, Percy, Rochdale Road East, and 30, Bridge Street, Heywood, co. Lancaster, chemist. First meeting, July 31, 3.30 p.m., Official Receiver's Offices, Byrom Street, Manchester. Public examination, September 19, 1922, 10.45 a.m., Court House, Mawdsley Street, Bolton.

Company Winding Up

RUSSELL OIL AND CHEMICAL CO., LTD., York Works, Short Road, Stratford, E.15. First meetings at 33, Carey Street, Lincoln's Inn, London, W.C.2, August 3; creditors at 11.30 a.m., and contributories at 12 noon.

Edinburgh Gazette

OZOBRITE CO. (THE), chemical manufacturers, 43, Wellington Street, Greenock (Thomas Robertson and Mrs. Sarah Robertson, partners). Estates sequestrated July 24. Meeting to elect the trustee and commissioners, on Friday, August 4, 1922, in the Masonic Temple, West Stewart Street, Greenock, at 12 noon.

New Companies Registered

KENTON'S MANUFACTURERS, LTD., 58, St. Vincent Street, Glasgow. Manufacturing chemists. Nominal capital, £2,000 in £1 shares.

EDWARD ALLEN AND CO., LTD., 9–10, Fenchurch Street, London. Wholesale and retail dealers in chemicals, etc. Nominal capital, £1,000 in £1 shares.

ESSENTIAL PRODUCTS, LTD., 59, Southern Road, Plaistow, London. Manufacturers of and dealers in soaps, perfumes, etc. Nominal capital, £100 in £1 shares.

MOX SYNDICATE, LTD., 31, Queen Victoria Street, London. To acquire patent rights relating to the production of heat by the alumino-thermic method, manufacturers of matches, crucibles, etc. Nominal capital £1,000 in £1 shares.

UNITED PAINT CO., LTD., 15, Great St. Helens, London. Manufacturers of and agents for paints, varnishes, anti-fouling compositions, etc. Nominal capital £100 in £1 shares.

ASPHALT, COLD MIX, LTD., 110 Edmund Street, Birmingham. To deal in, manufacture, and render saleable tar, pitch and other residual products obtained from coal, oil and other mineral substances, etc. Nominal capital, £5,000 in 4,900 10 per cent. cumulative preferred ordinary shares of £1 each and 2,000 deferred ordinary shares of 1s. each.

CYPRIUM, LTD., 638, Salisbury House, London, E.C.2. To acquire, exploit and work processes and methods for the treatment of metalliferous and other ores, etc. Nominal capital, £20,000 in £1 shares.

THRES CO., LTD., 47, Henry Street, Rishton, near Blackburn. Soap manufacturers, etc. Nominal capital, £2,000 in £1 shares.